US008216624B2

(12) **United States Patent**
Berry et al.

(10) **Patent No.: US 8,216,624 B2**
(45) **Date of Patent: *Jul. 10, 2012**

(54) **AERATED FOOD PRODUCTS**

(75) Inventors: **Mark John Berry**, Shambrook (GB); **Deryck Jozef Cebula**, Shambrook (GB); **Andrew Richard Cox**, Shambrook (GB); **Matthew Duncan Golding**, Vlaardingen (NL); **Robert Daniel Keenan**, Shambrook (GB); **Mark Emmett Malone**, Palmerston North (NZ); **Sarah Twigg**, Shambrook (GB)

(73) Assignee: **Conopco, Inc.**, Englewood Cliffs, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/168,209**

(22) Filed: **Jun. 27, 2005**

(65) **Prior Publication Data**

US 2006/0024417 A1 Feb. 2, 2006

(30) **Foreign Application Priority Data**

Jul. 27, 2004 (EP) 04254483
Mar. 3, 2005 (EP) 05251282

(51) **Int. Cl.**
A23G 9/00 (2006.01)
A23L 1/48 (2006.01)

(52) **U.S. Cl.** **426/564**; 426/565; 426/660

(58) **Field of Classification Search** 426/565, 426/103, 330.4, 564, 660, 650
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,627,983	A	12/1986	Scharf et al.	
4,874,627	A *	10/1989	Greig et al.	426/565
5,215,777	A	6/1993	Asher et al.	
6,096,867	A	8/2000	Byass et al.	
2001/0048962	A1 *	12/2001	Fenn et al.	426/565
2002/0197375	A1 *	12/2002	Adolphi et al.	426/565
2003/0148400	A1	8/2003	Haikara et al.	435/7.5
2004/0185162	A1 *	9/2004	Finnigan et al.	426/615

FOREIGN PATENT DOCUMENTS

DE	297 15 519	11/1997
EP	1 327 390	7/2003
JP	S52-102444	8/1977
JP	S53-6491	1/1978
JP	S58-81740	5/1983
JP	2003-507056	2/2003
JP	2007-522939	2/2006
WO	96/41882	12/1996
WO	WO 96/41882	12/1996
WO	99/54725	10/1999
WO	00/58342	10/2000
WO	WO 01/14521	3/2001

(Continued)

OTHER PUBLICATIONS

Fennema's Food Chemistry 4th Edition CRC Press 2008 pp. 727 and 728.*

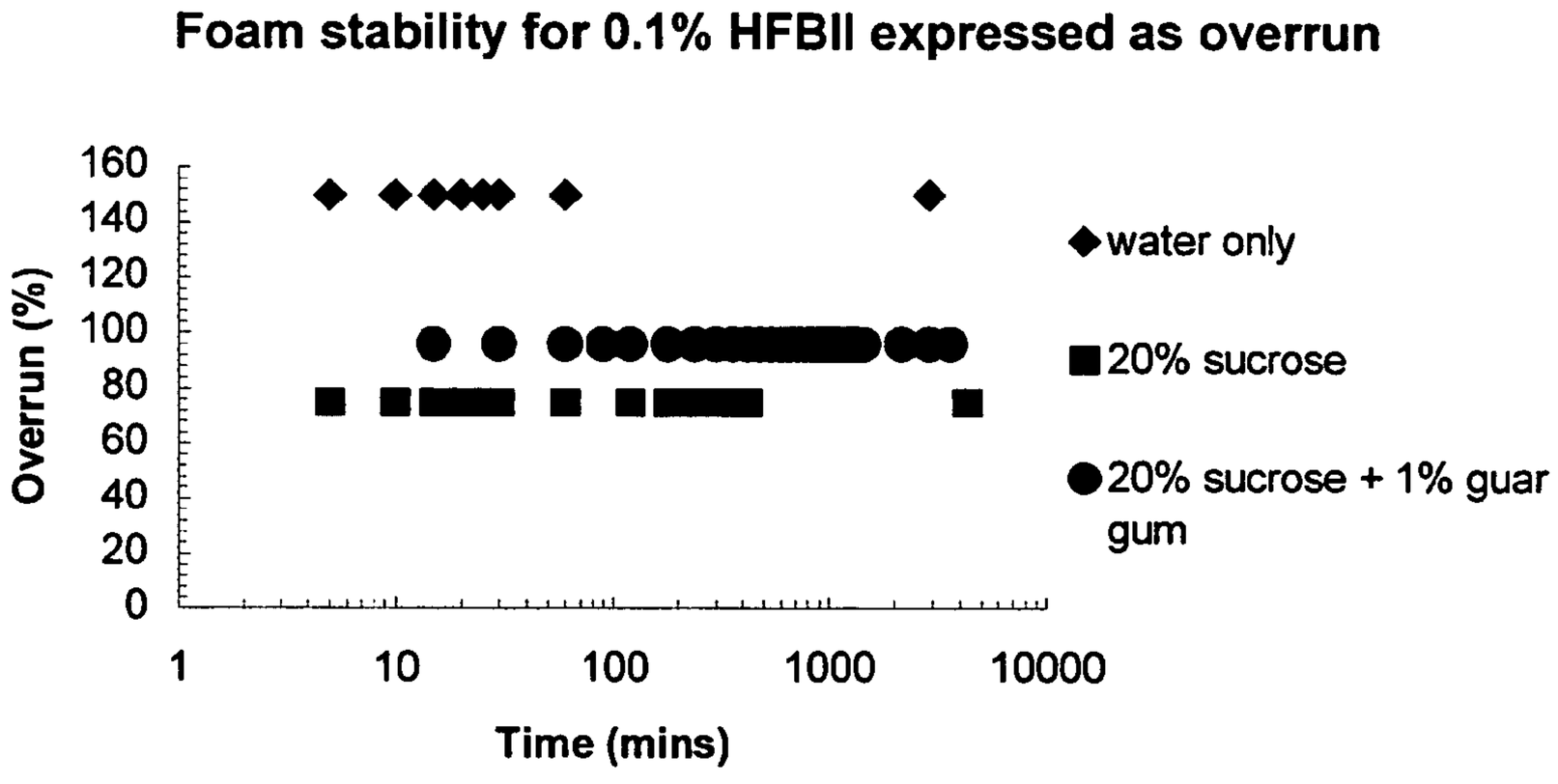
(Continued)

Primary Examiner — Kelly Bekker
(74) *Attorney, Agent, or Firm* — Morgan, Lewis & Bockius LLP

(57) **ABSTRACT**

An aerated food product is provided which includes hydrophobin. Also provided is the use of a hydrophobin in a method of inhibiting bubble coarsening in aerated food products.

5 Claims, 7 Drawing Sheets



FOREIGN PATENT DOCUMENTS

WO	01/57076	8/2001
WO	01/74864	10/2001
WO	03/015530	2/2003
WO	03/053383	7/2003

OTHER PUBLICATIONS

Dictionary.com, Stabilizer, pp. 1-5. print date Jun. 14, 2010.*
Guargum.biz, Guar Gum, pp. 1-2. print date Jun. 14, 2010.*
Database WPI, Section Ch, Week 200444, XP002313777 & KR 2004 018 844 A.
Scholmeijer et al., "Fungal Hydrophobins in Medical and Technical Applications", Applied Microbiology and Biotechnology, Springer Verlag, Berlin, DE, vol. 56, No. ½, pp. 1-8.
de Vocht et al., "Structural Characterization of the Hydrophobin SC3, as a Monomer and after Self-Assembly at Hydrophobic/Hydrophilic Interfaces", Biophys. J. 74: pp. 2059-2068.
Collin et al., "A novel two-step extraction method with detergent/polymer systems for primary recovery of the fusion protein endoglucanase 1-hydrophobin I", 2002, Biochim Biophys Acta. 1569: pp. 139-150.
Calonje et al., Properties of a hydrophobin isolated from the mycoparasitic fungus *Verticillium fungicola*, Can. J. Microbiol. 48: pp. 1030-1034.
Van der Werf, 2000 Leads in Life Sciences Jul. 2000: 5.
Co-pending application for Aldred et al., Case No. F3383(C); U.S. Appl. No. 11/168,214, filed Jun. 27, 2005.
Penttila et al., Molecular Biology of *Trichoderma* and Biotechnological Applications, "Handbook of Fungal Biotechnology" 2nd edition, edited by Dilip et al., vol. 20, pp. 413-427, 2004.
Russo et al., "The surface activity of the phytotoxin cerato-ulmin", 1982 National Research Council of Canada, pp. 1414-1422.
Stringer et al., "Cerato-ulmin, a Toxin Involved in Dutch Elm Disease, Is a Fungal Hydrophobin", The Plant Cell, Feb. 1993, pp. 145-146.
Woesten, "Hydrophobins, the fungal coat unravelled", Biochimica et Biophysica Seta. MR. Reviews on Biomembranes, Elsevier, Amsterdam, NL, vol. 1469, No. 2, Sep. 18, 2000,pp. 79-86.
Wessells J, "Fungal hydrophobins: proteins that function at an interface", Trends in Plant Science, Elsevier Science, Oxford GB, vol. 1, Jan. 1996, pp. 9-15.
Haakanpaa et al., "Atomic Resolution Structure of the HFBII Hydrophobin, a Self-assembling Amphiphile*", The Journal of Biological Chemistry, 2004, The American Society for Biochemistry and Molecular Biology, Inc., vol. 279, No. 1, Issue of Jan. 2, pp. 534-539.
Lindner et al., hydrophobins: the protein-amphiphiles of filamentous fungi, 2005, Elsevier B.V. on behalf of the Federation of European Microbiological Societies, pp. 1-20.
Gliga, Teodora, article available on the Internet of at least May 20, 2007, regarding hydrophobins, with translation, pp. 1-21.
International Search Report on Application No. PCT/EP2005/006997 dated Dec. 13, 2005, pp. 1-4.
International Search Report on Application No. PCT/EP2005/006996 dated Oct. 18, 2005, pp. 1-5.
European Search Report on Application No. EP 04 25 4483 dated Jan. 17, 2005, pp. 1-2.
European Search Report on Application No. EP 05 07 6480 dated Oct. 3, 2005, pp. 1-4.
European Search Report on Application No. EP 05 07 6481 dated Oct. 3, 2005, pp. 1-4.
Database WPI, Section Ch, Week 200444, XP002313777 & KR 2004 018 844 A, p. 1. Mar. 4, 2004.
Scholmeijer et al., "Fungal Hydrophobins in Medical and Technical Applications", Applied Microbiology and Biotechnology, Springer Verlag, Berlin, DE, vol. 56, No. ½, pp. 1-8, May 2001.
Wessels, "Hydrophobins: Proteins that Change the Nature of the Fungal Surface", 1997, Adv. Microb. Physio 38: pp. 1-45.
Wosten, "Hydrophobins: Multipurpose Proteins", 2001, Annu Rev. Microbiol. 55: pp. 625-646.
de Vocht et al., "Structural Characterization of the Hydrophobin SC3, as a Monomer and after Self-Assembly at Hydrophobic/Hydrophilic Interfaces", Biophys. J. 74: pp. 2059-2068, Apr. 1998.
Collin et al., "A novel-two-step extraction method with detergent/polymer systems for primary recovery of the fusion protein endoglucanase I-hydrophobin I", 2002, Biochim Biophys Acta. 1569: pp. 139-150.
Calonje et al., Properties of a hydrophobin isolated from the mycoparasitic fungus *Verticillium fungicola*, Can. J. Microbiol. 48: pp. 1030-1034, 2002.
Askolin et al., "Overproduction, purification, and characterization of the *Trichoderma reesei* hydrophobin HFBI", 2001, Appl. Microbiol Biotechnol. 57: pp. 124-130.
De Vries et al., Identification and characterization of a tri-partite hydrophobin from *Claviceps fusiformis*, 1999, Eur J. Biochem. 262: pp. 377-385.
Kershaw et al., "Hydrophobins and Repellents: Proteins with Fundamental Roles in Fungal Morphogenesis", 1998, Fungal Genetics and Biology 23: pp. 18-33.
Van der Werf, 2000 Leads in Life Sciences Jul. 2000: 5, p. 1.
Talbot, 2001 fungal Hhydrophobins in "The Mycota: A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research" Howard andGow (Eds), vol. 7: "Biology of the Fungal Cell" springer-Verlag, Berline and Heidelberg GmbH and Co., pp. 145-159.
Co-pending application for Aldred et al., Case No. F3383(C); U.S. Appl. No. 11/168,214, filed Jun. 27, 2005, p. 1-27.

* cited by examiner

Figure 1

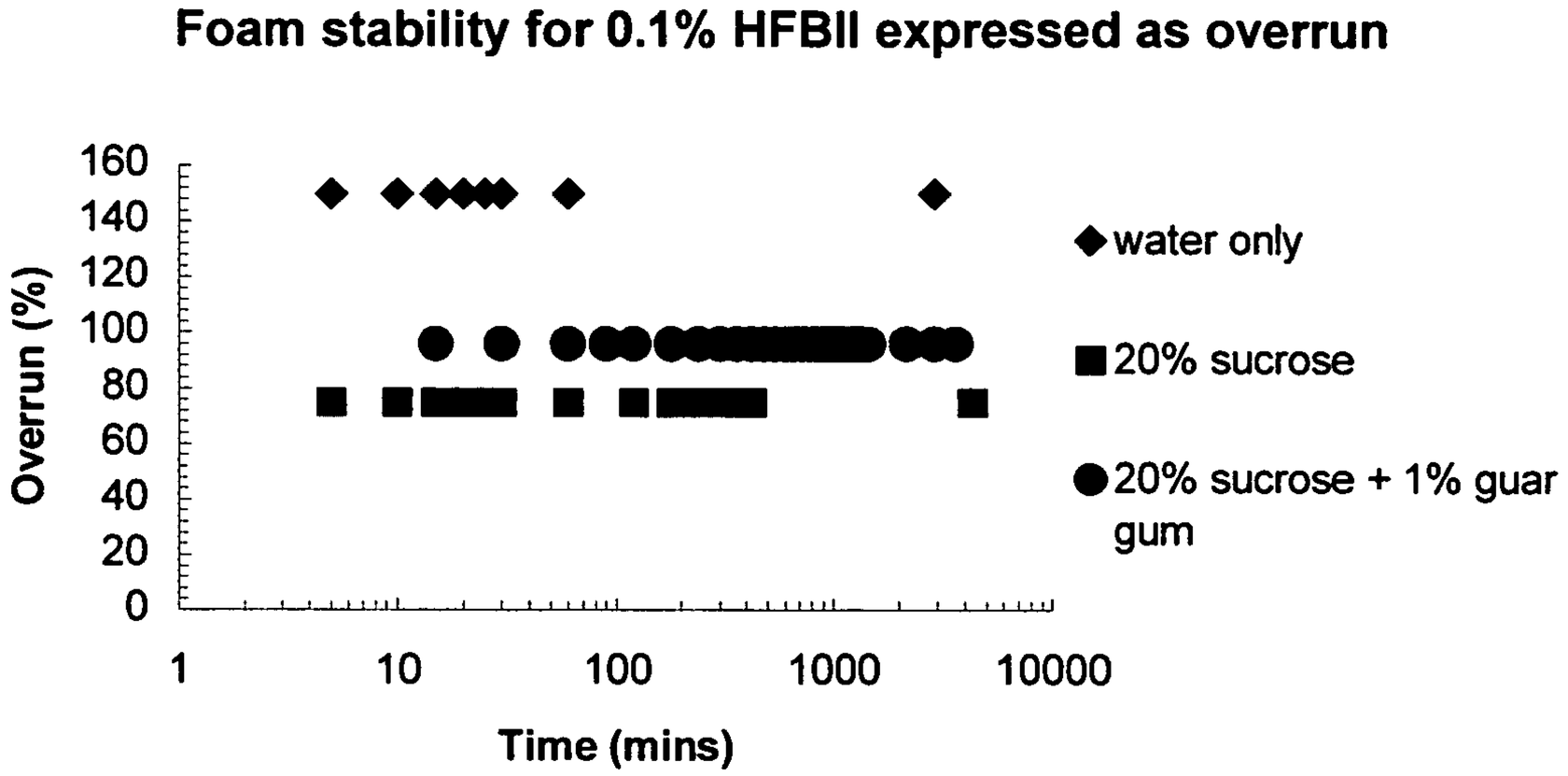


Figure 2

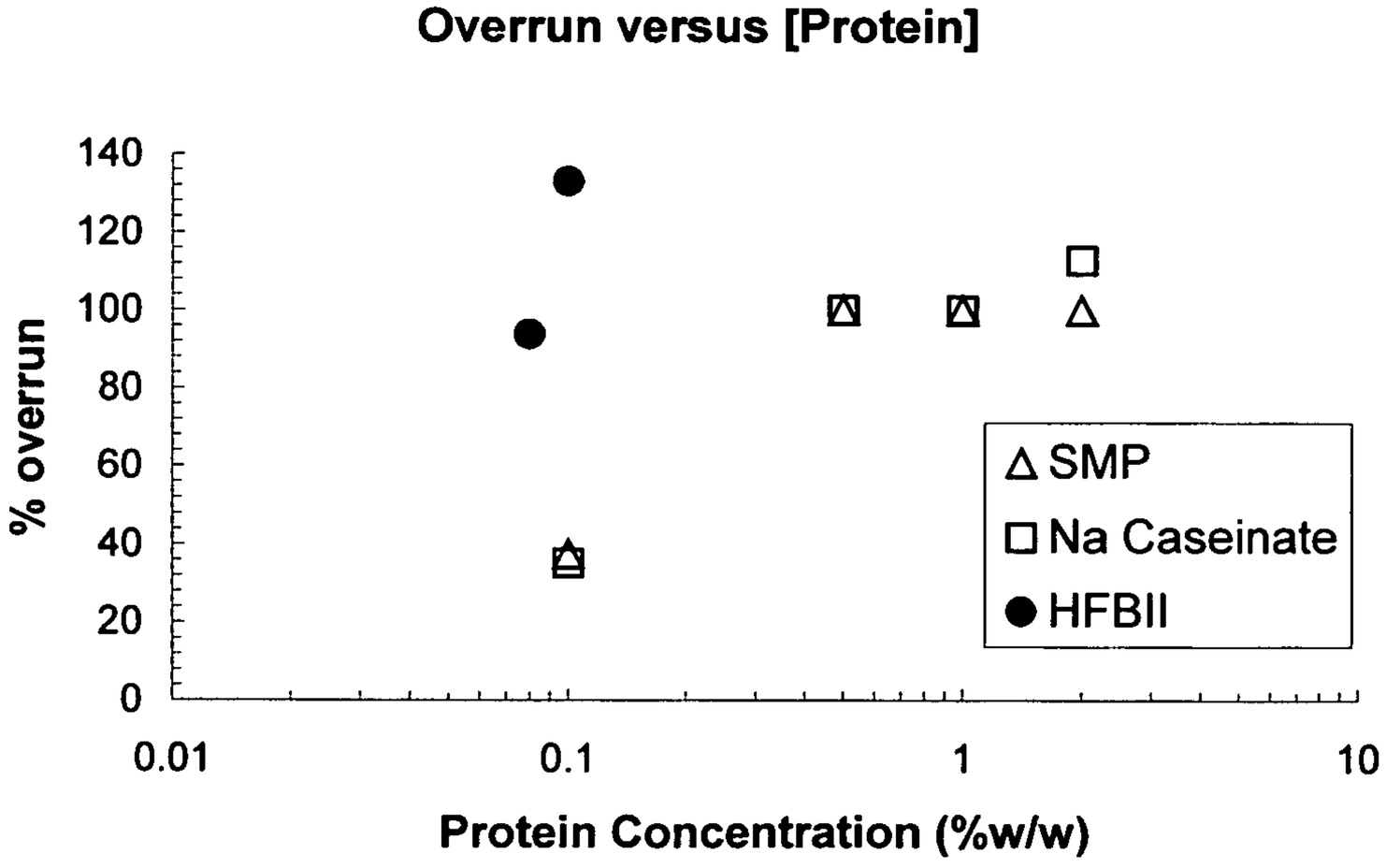
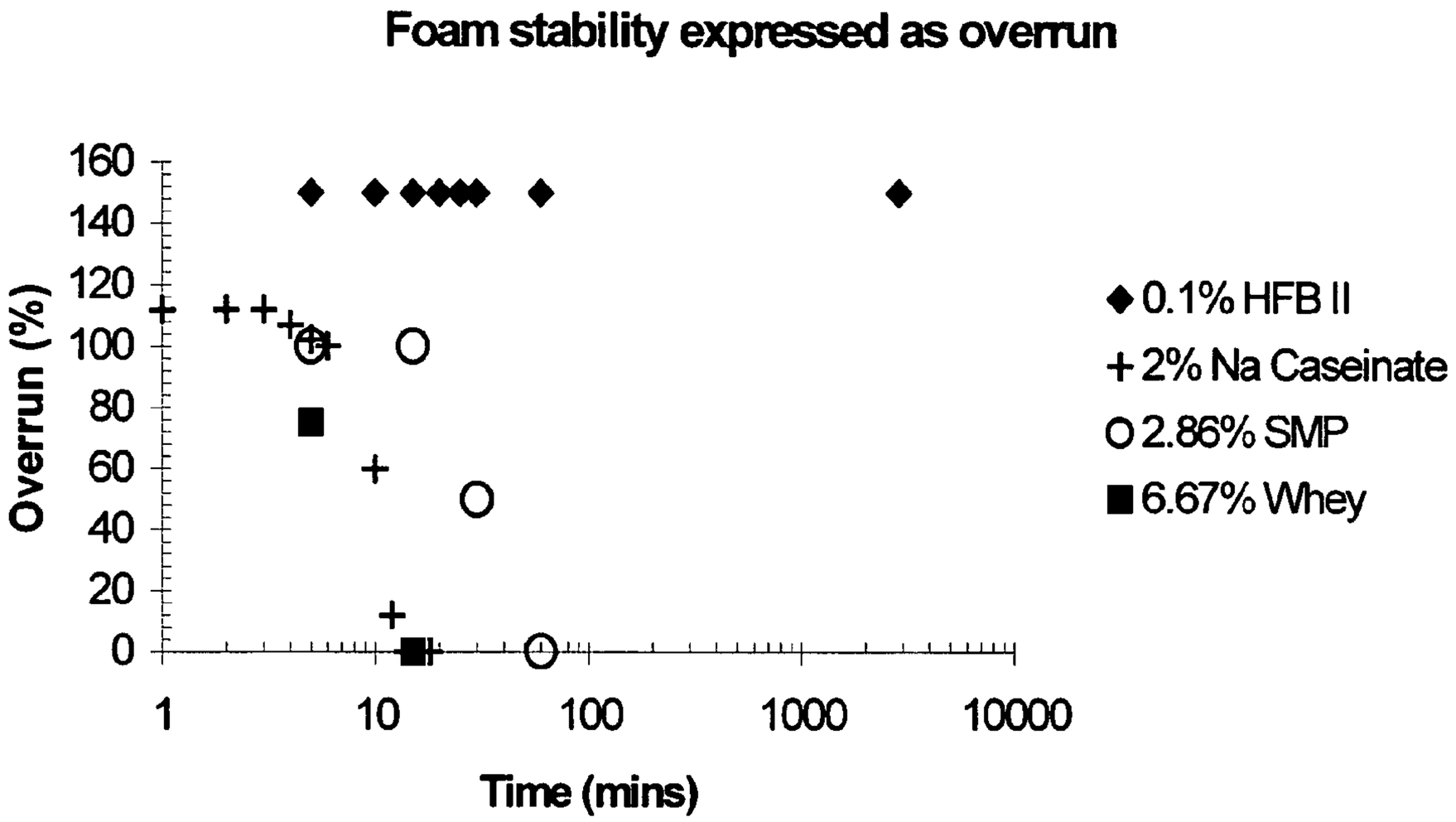


Figure 3

A


Foam stability expressed as overrun
Overrun (%)
160
140
120
100
80
60
40
20
0
1
10
100
1000
10000
Time (mins)
0.1% HFB II
2% Na Caseinate
2.86% SMP
6.67% Whey

B

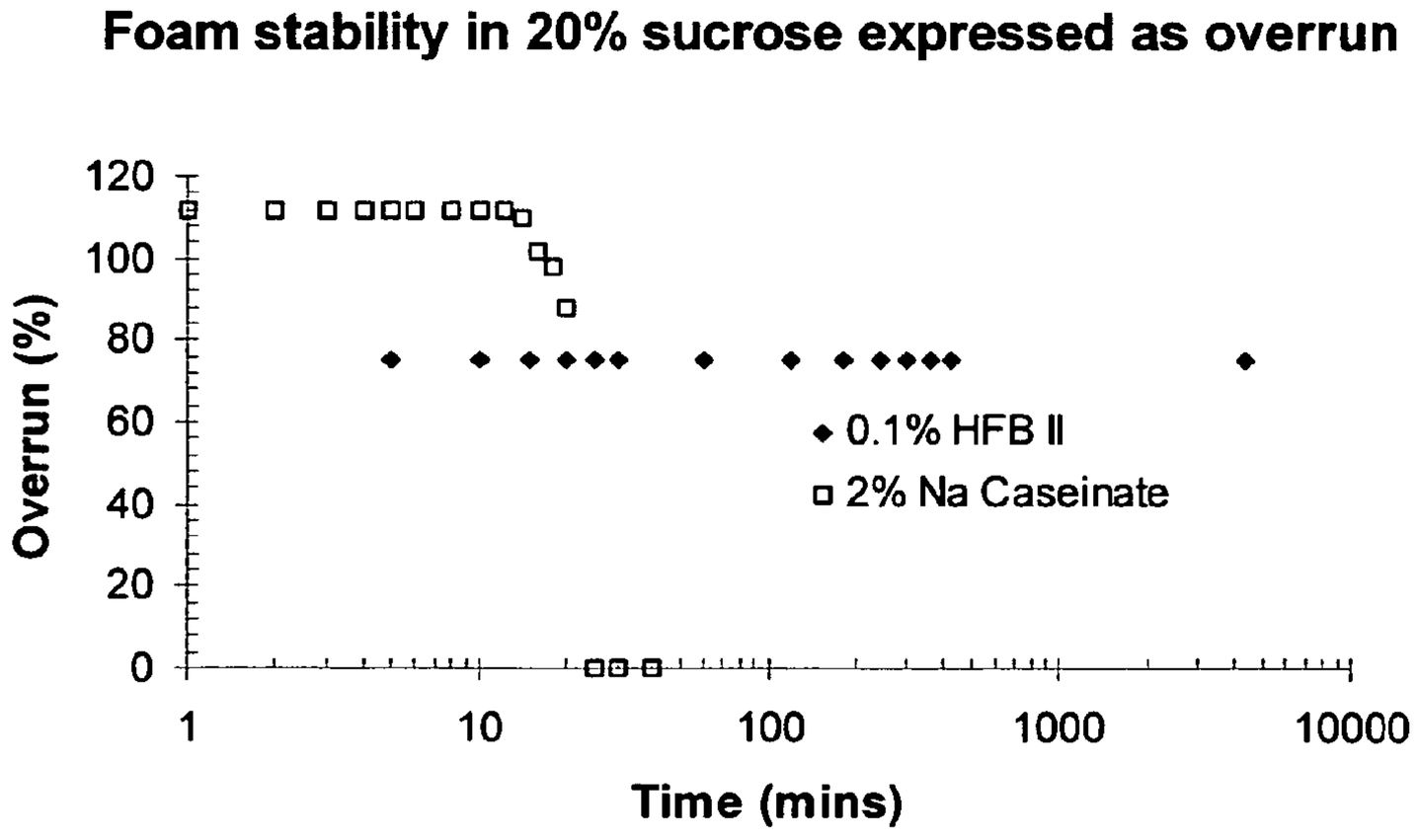

Foam stability in 20% sucrose expressed as overrun
Overrun (%)
120
100
80
60
40
20
0
1
10
100
1000
10000
Time (mins)
0.1% HFB II
2% Na Caseinate

Figure 3 (cont).

C

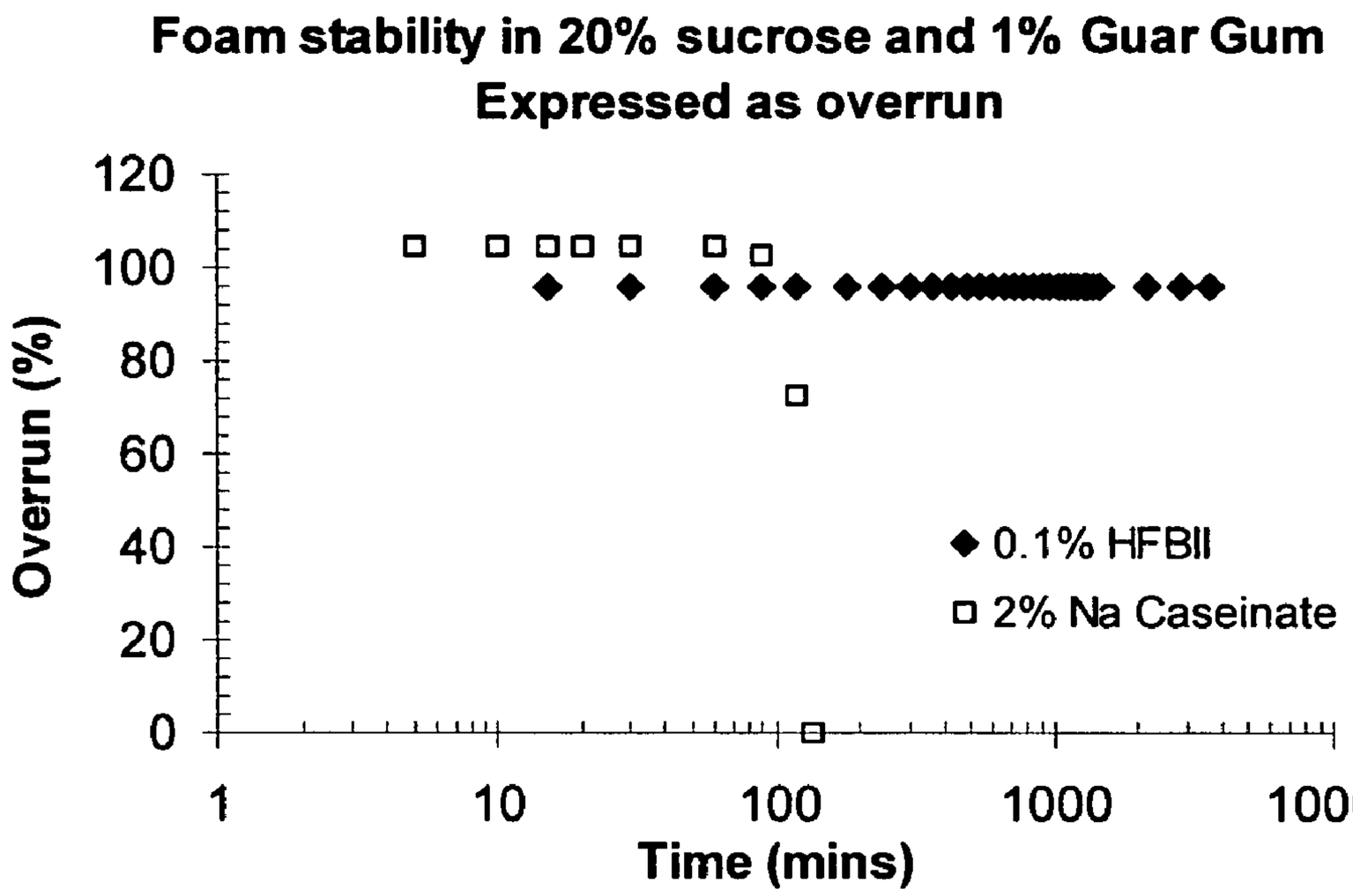


Figure 4

A (1 day at chill temperature)

B (2 weeks at chill temperature)

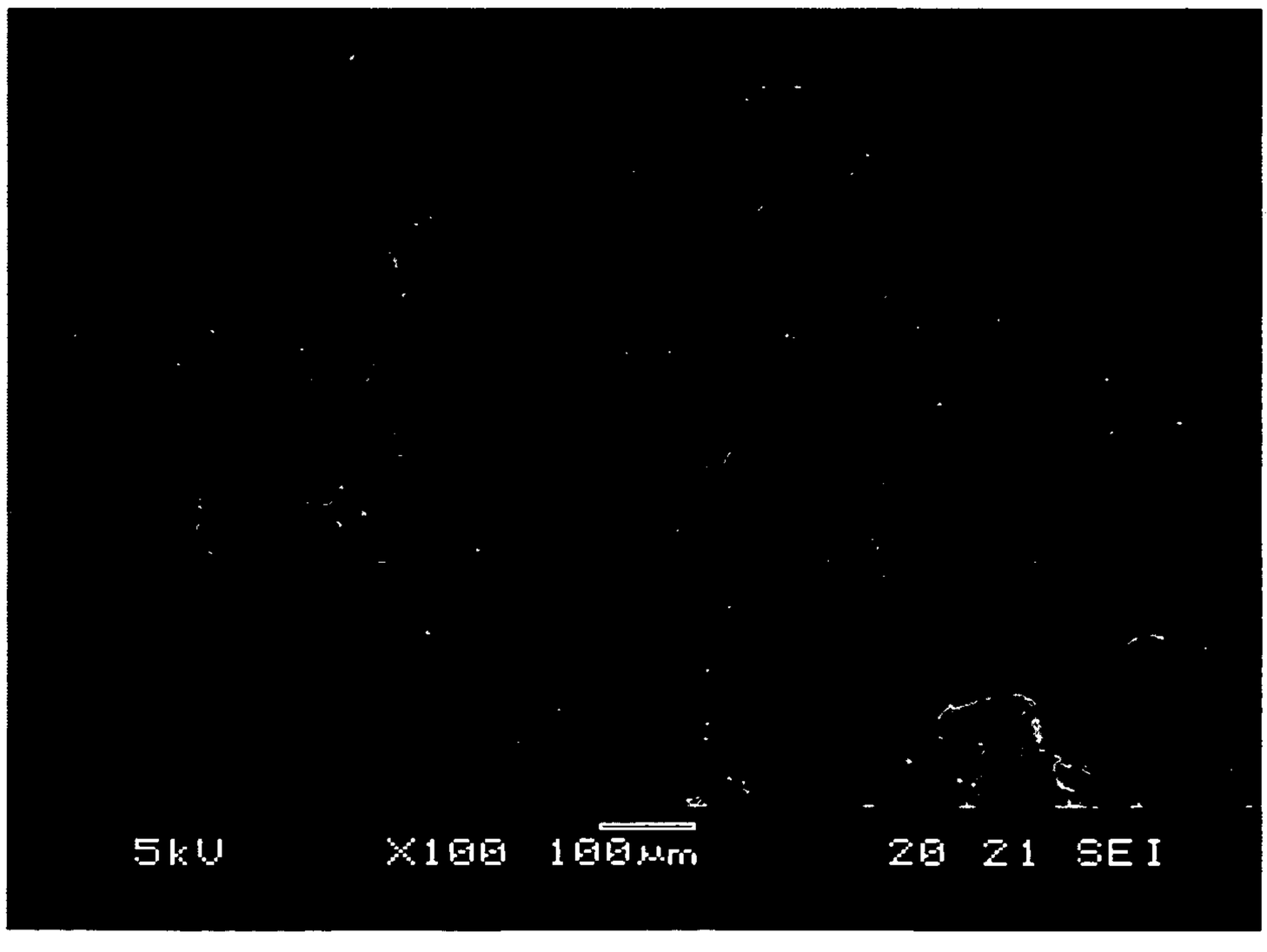


Figure 5

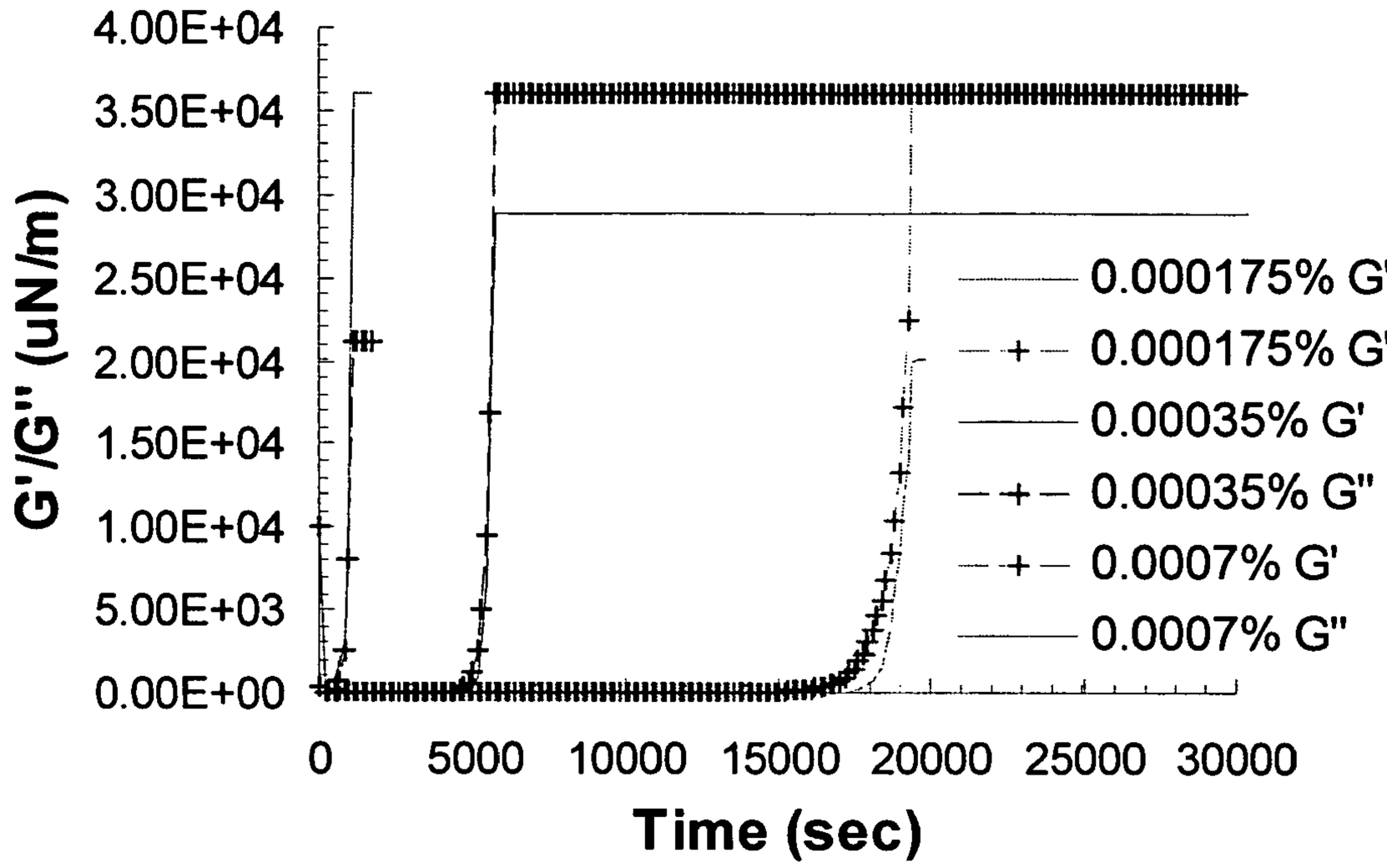


Figure 6

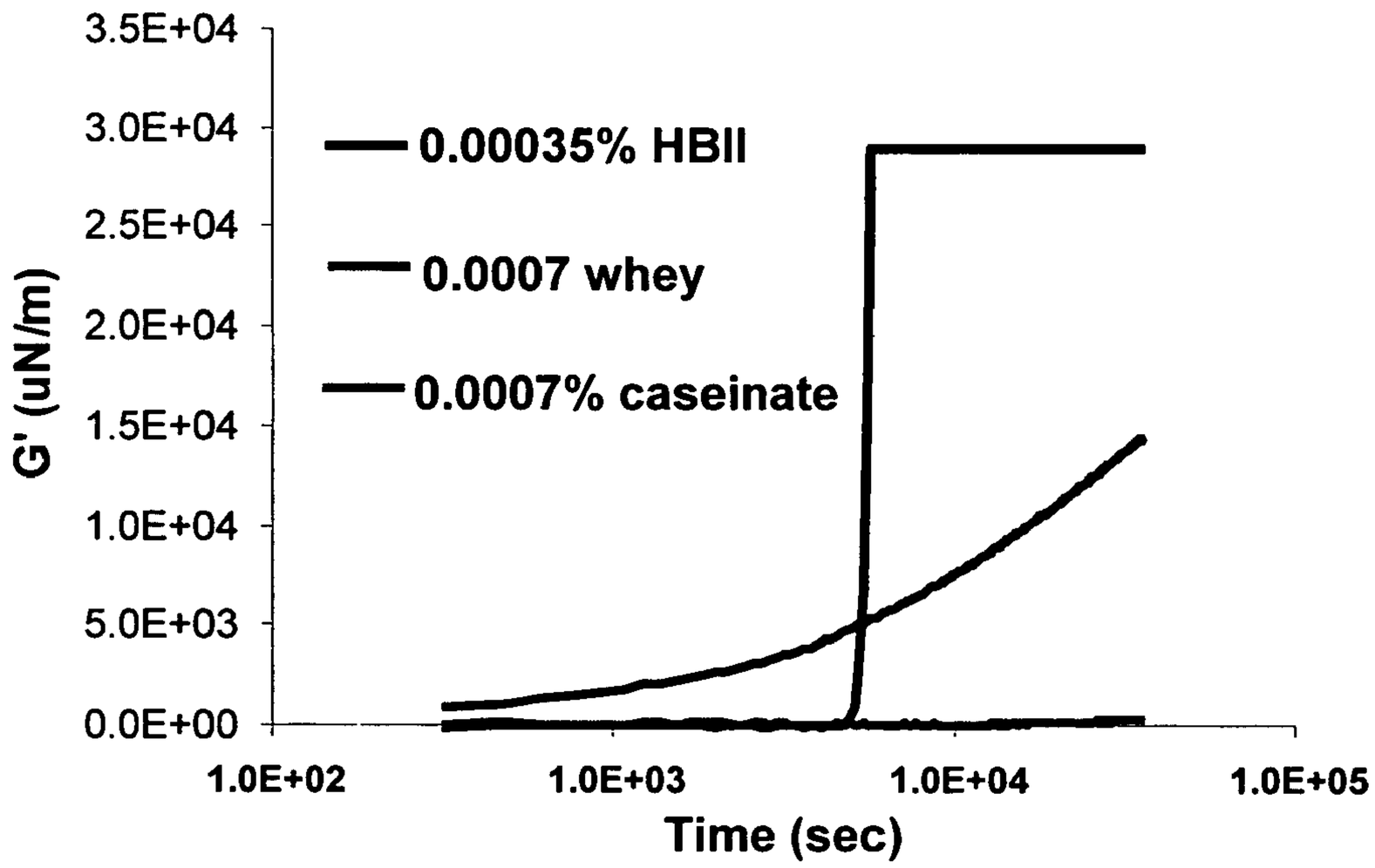
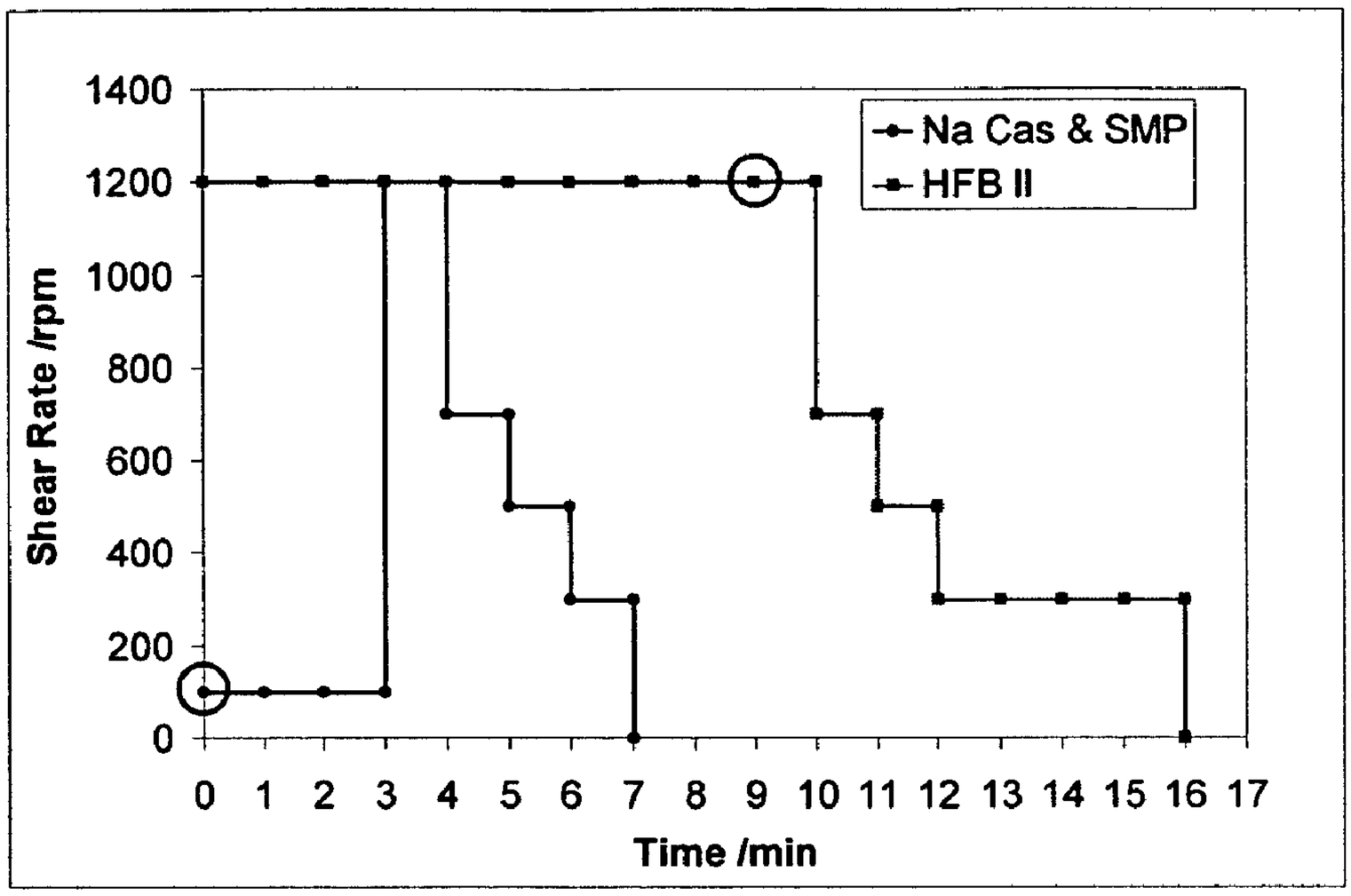


Figure 7



○ -18°C Cooling Switched On

Figure 8

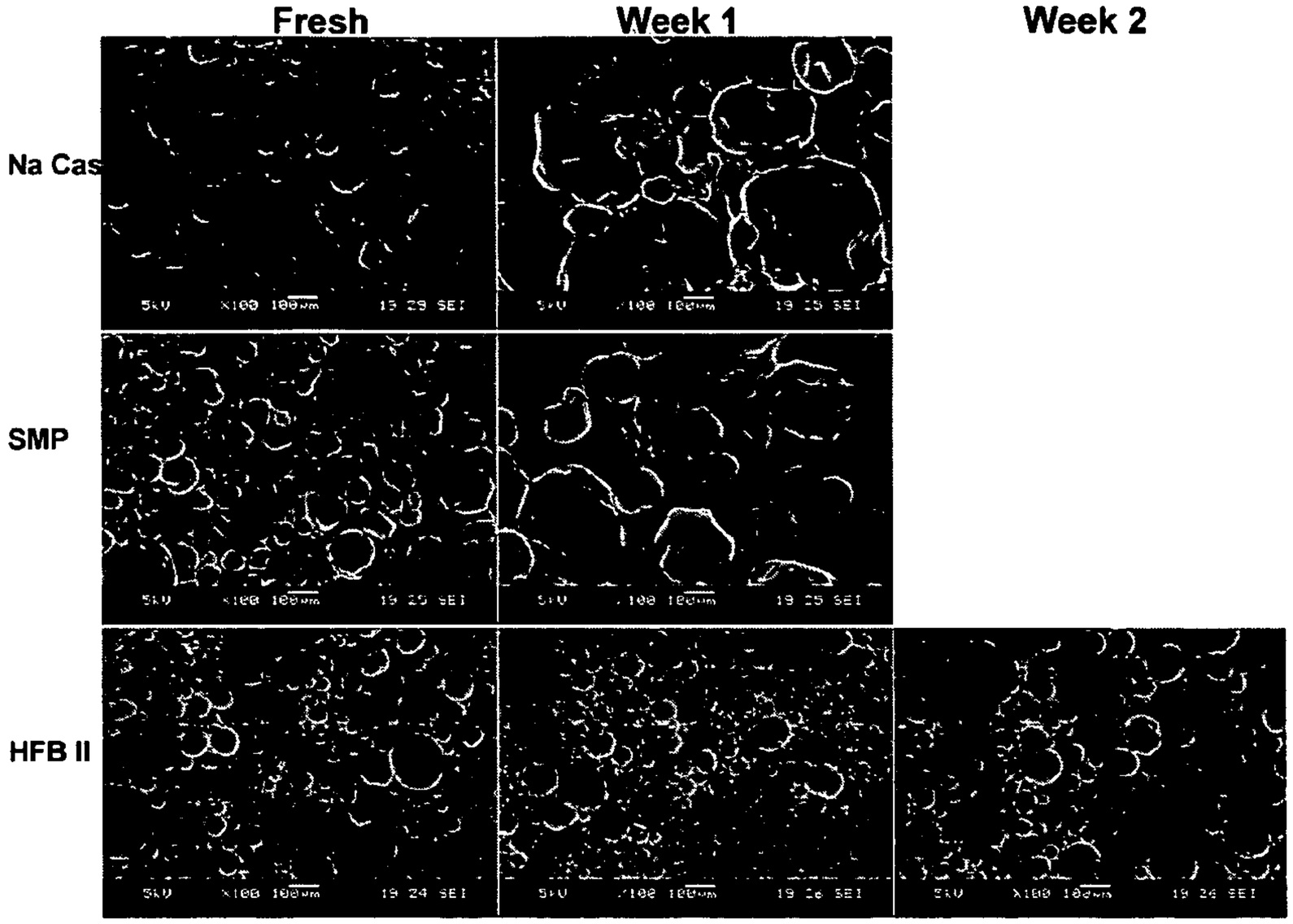
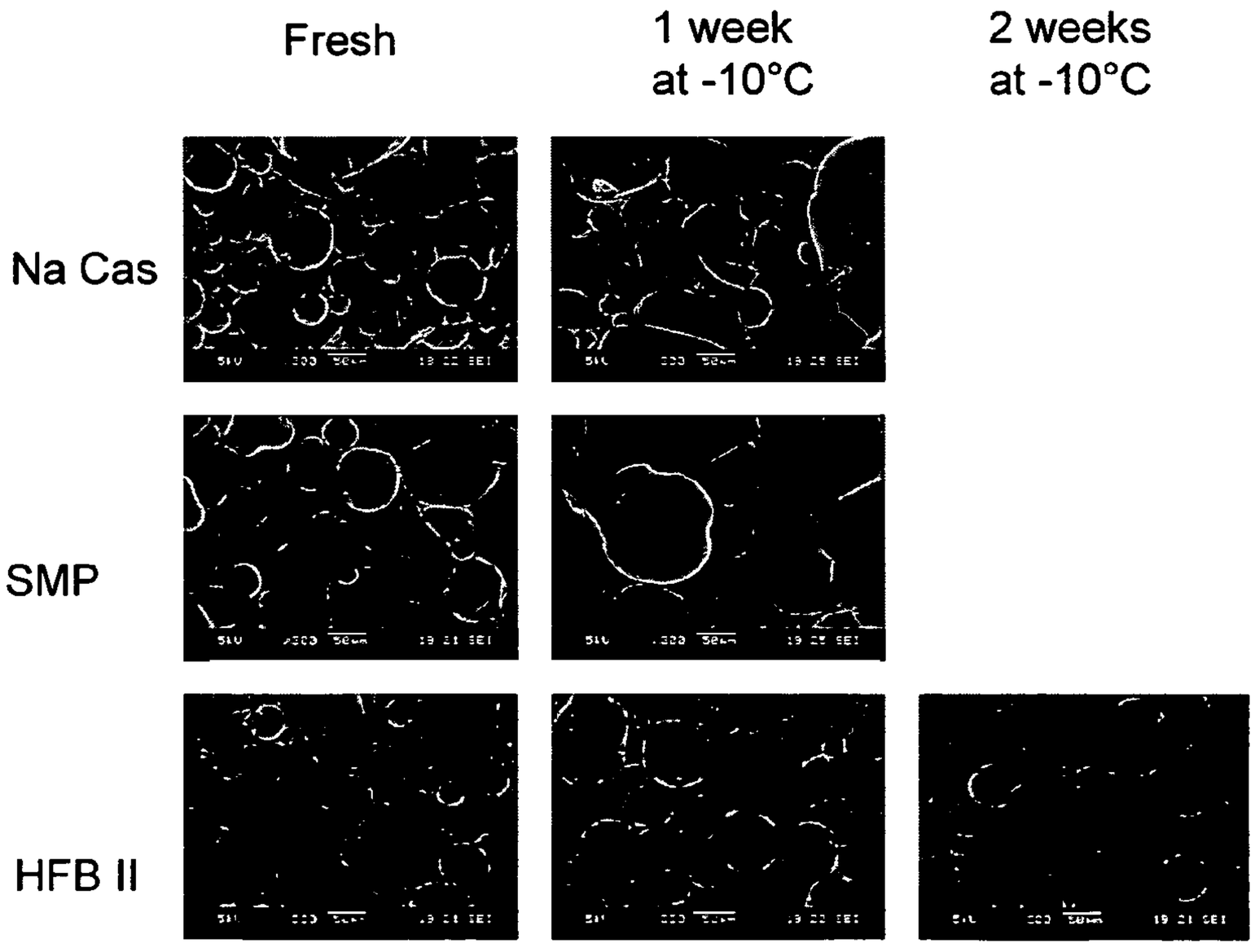


Figure 9



AERATED FOOD PRODUCTS

FIELD OF THE INVENTION

The present invention relates to aerated food products that include hydrophobins.

BACKGROUND TO THE INVENTION

A wide variety of food products contain introduced gas, such as air, nitrogen and/or carbon dioxide. Such foods include frozen and chilled food products, for example ice cream and mousses. Two key considerations arise in the production and storage of aerated food products, namely the ability to incorporate gas into the product during manufacture (foamability) and the subsequent stability of the gas bubbles during storage (foam stability). A number of additives are included in aerated food products to assist in the creation and maintenance of foam. These include proteins such as sodium caseinate and whey, which are highly foamable, and biopolymers, such as carrageenans, guar gum, locust bean gum, pectins, alginates, xanthan, gellan, gelatin and mixtures thereof, which are good stabilisers. However, although stabilisers used in the art can often maintain the total foam volume, they are poor at inhibiting the coarsening of the foam microstructure, i.e. increase in gas bubble size by processes such as disproportionation and coalescence. Further, many of the ingredients used to stabilise the gas phase in aerated food products need to be added at fairly high levels which can have deleterious textural and/or calorific consequences.

SUMMARY OF THE INVENTION

We have found that a class of proteins found in fungi, termed hydrophobins, combine high foamability and good foam stabilisation properties. In particular, hydrophobins have been found to provide both excellent foam volume stability and inhibition of coarsening. Further, the levels of hydrophobin required to achieve excellent product stability are relatively low. It will therefore be possible to replace some or all of the conventional ingredients used to form and stabilise aerated food products with smaller amounts of hydrophobin.

Accordingly, the present invention provides an aerated food product comprising a hydrophobin. In a related aspect, the present invention provides an aerated food product in which the air phase is at least partially stabilised with hydrophobin. In another related aspect, the present invention provides an aerated food product comprising hydrophobin in which the hydrophobin is associated with the air phase.

Preferably the hydrophobin is a class II hydrophobin.

In a preferred embodiment, the hydrophobin is present in an amount of at least 0.001 wt %, more preferably at least 0.01 wt %.

In a related aspect, the present invention provides a composition for producing an aerated food product of the invention, which composition comprises hydrophobin, preferably hydrophobin in isolated form, together with at least one of the remaining ingredients of the food product. Preferably the composition comprises all the remaining ingredients of the food product.

In a related embodiment, the present invention provides a dry composition for producing an aerated food product of the invention, which composition comprises hydrophobin, preferably hydrophobin in isolated form, together with at least one of the remaining non-liquid ingredients of the food product. Preferably the composition comprises all the remaining non-liquid ingredients of the food product.

The present invention further provides the use of a hydrophobin in a method of inhibiting bubble coarsening in an aerated food product.

In a related aspect the present invention provides a method of inhibiting bubble coarsening in an aerated food product which method comprises adding hydrophobin to the food product prior to and/or during aeration of the product.

The present invention also provides the use of a hydrophobin in a method of stabilising a foam in an aerated food product.

In a related aspect the present invention also provides a method of stabilising a foam in an aerated food product which method comprises adding hydrophobin to the food product prior to and/or during aeration of the product.

The present invention further provides the use of a hydrophobin in a method of improving shape retention and/or rigidity in an aerated food product.

In a related aspect the present invention provides a method of improving shape retention and/or rigidity in an aerated food product which method comprises adding hydrophobin to the food product prior to and/or during aeration of the product.

DETAILED DESCRIPTION OF THE INVENTION

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art (e.g. in chilled confectionery/frozen confectionery manufacture, chemistry and biotechnology). Definitions and descriptions of various terms and techniques used in chilled/frozen confectionery manufacture are found in Ice Cream, 4th Edition, Arbuckle (1986), Van Nostrand Reinhold Company, New York, N.Y. Standard techniques used for molecular and biochemical methods can be found in Sambrook et al., Molecular Cloning: A Laboratory Manual, 3rd ed. (2001) Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y. and Ausubel et al., Short Protocols in Molecular Biology (1999) 4th Ed, John Wiley & Sons, Inc.—and the full version entitled Current Protocols in Molecular Biology).

Hydrophobins

Hydrophobins are a well-defined class of proteins (Wessels, 1997, Adv. Microb. Physio. 38: 1-45; Wosten, 2001, Annu Rev. Microbiol. 55: 625-646) capable of self-assembly at a hydrophobic/hydrophilic interface, and having a conserved sequence:

$$X_n\text{-C-}X_{5\text{-}9}\text{-C-C-}X_{11\text{-}39}\text{-C-}X_{8\text{-}23}\text{-C-}X_{5\text{-}9}\text{-C-C-}X_{6\text{-}18}\text{-C-}X_m \quad \text{(SEQ ID No. 1)}$$

where X represents any amino acid, and n and m independently represent an integer. Typically, a hydrophobin has a length of up to 125 amino acids. The cysteine residues (C) in the conserved sequence are part of disulphide bridges. In the context of the present invention, the term hydrophobin has a wider meaning to include functionally equivalent proteins still displaying the characteristic of self-assembly at a hydrophobic-hydrophilic interface resulting in a protein film, such as proteins comprising the sequence:

$$X_n\text{-C-}X_{1\text{-}50}\text{-C-}X_{0\text{-}5}\text{-C-}X_{1\text{-}100}\text{-C-X-}_{1\text{-}100}\text{-}X_{1\text{-}50}\text{-C-}X_{0\text{-}5}\text{-C-}X_{1\text{-}50}\text{-C-}X_m \quad \text{(SEQ ID No. 2)}$$

or parts thereof still displaying the characteristic of self-assembly at a hydrophobic-hydrophilic interface resulting in a protein film. In accordance with the definition of the present invention, self-assembly can be detected by adsorbing the

protein to Teflon and using Circular Dichroism to establish the presence of a secondary structure (in general, α-helix) (De Vocht et al., 1998, Biophys. J. 74: 2059-68).

The formation of a film can be established by incubating a Teflon sheet in the protein solution followed by at least three washes with water or buffer (Wosten et al., 1994, Embo. J. 13: 5848-54). The protein film can be visualised by any suitable method, such as labeling with a fluorescent marker or by the use of fluorescent antibodies, as is well established in the art. m and n typically have values ranging from 0 to 2000, but more usually m and n in total are less than 100 or 200. The definition of hydrophobin in the context of the present invention includes fusion proteins of a hydrophobin and another polypeptide as well as conjugates of hydrophobin and other molecules such as polysaccharides.

Hydrophobins identified to date are generally classed as either class I or class II. Both types have been identified in fungi as secreted proteins that self-assemble at hydrophobilic interfaces into amphipathic films. Assemblages of class I hydrophobins are relatively insoluble whereas those of class II hydrophobins readily dissolve in a variety of solvents.

Hydrophobin-like proteins have also been identified in filamentous bacteria, such as *Actinomycete* and *Steptomyces* sp. (WO01/74864). These bacterial proteins, by contrast to fungal hydrophobins, form only up to one disulphide bridge since they have only two cysteine residues. Such proteins are an example of functional equivalents to hydrophobins having the consensus sequences shown in SEQ ID Nos. 1 and 2, and are within the scope of the present invention.

The hydrophobins can be obtained by extraction from native sources, such as filamentous fungi, by any suitable process. For example, hydrophobins can be obtained by culturing filamentous fungi that secrete the hydrophobin into the growth medium or by extraction from fungal mycelia with 60% ethanol. It is particularly preferred to isolate hydrophobins from host organisms that naturally secrete hydrophobins. Preferred hosts are hyphomycetes (e.g. *Trichoderma*), basidiomycetes and ascomycetes. Particularly preferred hosts are food grade organisms, such as *Cryphonectria parasitica* which secretes a hydrophobin termed cryparin (MacCabe and Van Alfen, 1999, App. Environ. Microbiol 65: 5431-5435).

Alternatively, hydrophobins can be obtained by the use of recombinant technology. For example host cells, typically micro-organisms, may be modified to express hydrophobins and the hydrophobins can then be isolated and used in accordance with the present invention. Techniques for introducing nucleic acid constructs encoding hydrophobins into host cells are well known in the art. More than 34 genes coding for hydrophobins have been cloned, from over 16 fungal species (see for example WO96/41882 which gives the sequence of hydrophobins identified in *Agaricus bisporus*; and Wosten, 2001, Annu Rev. Microbiol. 55: 625-646). Recombinant technology can also be used to modify hydrophobin sequences or synthesise novel hydrophobins having desired/improved properties.

Typically, an appropriate host cell or organism is transformed by a nucleic acid construct that encodes the desired hydrophobin. The nucleotide sequence coding for the polypeptide can be inserted into a suitable expression vector encoding the necessary elements for transcription and translation and in such a manner that they will be expressed under appropriate conditions (e.g. in proper orientation and correct reading frame and with appropriate targeting and expression sequences). The methods required to construct these expression vectors are well known to those skilled in the art.

A number of expression systems may be used to express the polypeptide coding sequence. These include, but are not limited to, bacteria, fungi (including yeast), insect cell systems, plant cell culture systems and plants all transformed with the appropriate expression vectors. Preferred hosts are those that are considered food grade—'generally regarded as safe' (GRAS).

Suitable fungal species, include yeasts such as (but not limited to) those of the genera *Saccharomyces, Kluyveromyces, Pichia, Hansenula, Candida, Schizo saccharomyces* and the like, and filamentous species such as (but not limited to) those of the genera *Aspergillus, Trichoderma, Mucor, Neurospora, Fusarium* and the like.

The sequences encoding the hydrophobins are preferably at least 80% identical at the amino acid level to a hydrophobin identified in nature, more preferably at least 95% or 100% identical. However, persons skilled in the art may make conservative substitutions or other amino acid changes that do not reduce the biological activity of the hydrophobin. For the purpose of the invention these hydrophobins possessing this high level of identity to a hydrophobin that naturally occurs are also embraced within the term "hydrophobins".

Hydrophobins can be purified from culture media or cellular extracts by, for example, the procedure described in WO01/57076 which involves adsorbing the hydrophobin present in a hydrophobin-containing solution to surface and then contacting the surface with a surfactant, such as Tween 20, to elute the hydrophobin from the surface. See also Collen et al., 2002, Biochim Biophys Acta. 1569: 139-50; Calonje et al., 2002, Can. J. Microbiol. 48: 1030-4; Askolin et al., 2001, Appl Microbiol Biotechnol. 57: 124-30; and De Vries et al., 1999, Eur J Biochem. 262: 377-85.

Aerated Food Products

Aerated food products of the invention typically fall into one of four groups—hot, ambient, chilled or frozen. The term "food" includes beverages. Hot food products include beverages such as cappuccino coffee. Ambient aerated food products include whipped cream, marshmallows and bakery products, e.g. bread. Chilled aerated food products include whipped cream, mousses and beverages such as beer, milk shakes and smoothies. Frozen aerated food products include frozen confections such as ice cream, milk ice, frozen yoghurt, sherbet, slushes, frozen custard, water ice, sorbet, granitas and frozen purees.

Preferably the aerated food product is an aerated confectionery product.

The term "aerated" means that gas has been intentionally incorporated into the product, such as by mechanical means. The gas can be any food-grade gas such as air, nitrogen or carbon dioxide. The extent of aeration is typically defined in terms of "overrun". In the context of the present invention, % overrun is defined in volume terms as:

((volume of the final aerated product−volume of the mix)/volume of the mix)×100

The amount of overrun present in the product will vary depending on the desired product characteristics. For example, the level of overrun in ice cream is typically from about 70 to 100%, and in confectionery such as mousses the overrun can be as high as 200 to 250 wt %, whereas the overrun in water ices is from 25 to 30%. The level of overrun in some chilled products, ambient products and hot products can be lower, but generally over 10%, e.g. the level of overrun in milkshakes is typically from 10 to 40 wt %.

The amount of hydrophobin present in the product will generally vary depending on the product formulation and volume of the air phase. Typically, the product will contain at

least 0.001 wt %, hydrophobin, more preferably at least 0.005 or 0.01 wt %. Typically the product will contain less than 1 wt % hydrophobin. The hydrophobin may be from a single source or a plurality of sources e.g. the hydrophobin can a mixture of two or more different hydrophobin polypeptides.

Preferably the hydrophobin is a class II hydrophobin.

The present invention also encompasses compositions for producing an aerated food product of the invention, which composition comprises a hydrophobin. Such compositions include liquid premixes, for example premixes used in the production of frozen confectionery products, and dry mixes, for example powders, to which an aqueous liquid, such as milk or water, is added prior to or during aeration.

Such compositions include liquid premixes, for example premixes used in the production of frozen confectionery products, and dry mixes, for example powders, to which an aqueous liquid, such as milk or water, is added prior to or during aeration.

The compositions for producing a frozen food product of the invention, will comprise other ingredients, in addition to the hydrophobin, which are normally included in the food product, e.g. sugar, fat, emulsifiers, flavourings etc. The compositions may include all of the remaining ingredients required to make the food product such that the composition is ready to be processed, i.e. aerated, to form an aerated food product of the invention.

Dry compositions for producing an aerated food product of the invention will also comprise other ingredients, in addition to the hydrophobin, which are normally included in the food product, e.g. sugar, fat, emulsifiers, flavourings etc. The compositions may include all of the remaining non-liquid ingredients required to make the food product such that all that the user need only add an aqueous liquid, such as water or milk, and the composition is ready to be processed to form an aerated food product of the invention. These dry compositions, examples of which include powders and granules, can be designed for both industrial and retail use, and benefit from reduced bulk and longer shelf life.

The hydrophobin is added in a form and in an amount such that it is available to stabilise the air phase. By the term "added", we mean that the hydrophobin is deliberately introduced into the food product for the purpose of taking advantage of its foam stabilising properties. Consequently, where food ingredients are present or added that contain fungal contaminants, which may contain hydrophobin polypeptides, this does not constitute adding hydrophobin within the context of the present invention.

Typically, the hydrophobin is added to the food product in a form such it is capable of self-assembly at an air-liquid surface.

Typically, the hydrophobin is added to the food product or compositions of the invention in an isolated form, typically at least partially purified, such as at least 10% pure, based on weight of solids. By "added in isolated form", we mean that the hydrophobin is not added as part of a naturally-occurring organism, such as a mushroom, which naturally expresses hydrophobins. Instead, the hydrophobin will typically either have been extracted from a naturally-occurring source or obtained by recombinant expression in a host organism.

In one embodiment, the hydrophobin is added to the food product in monomeric, dimeric and/or oligomeric (i.e. consisting of 10 monomeric units or fewer) form. Preferably at least 50 wt % of the added hydrophobin is in at least one of these forms, more preferably at least 75, 80, 85 or 90 wt %. Once added, the hydrophobin will typically undergo assembly at the air/liquid interface and therefore the amount of monomer, dimer and oligomer would be expected to decrease.

In one embodiment, the hydrophobin is added to the aerated food product or compositions of the invention in an isolated form, typically at least partially purified.

The added hydrophobin can be used to stabilise the air phase in an aerated food product, generally by inhibiting bubble coarsening, i.e. hydrophobins have been found not only to stabilise foam volume but also the size of the bubbles within the foam.

The present invention will now be described further with reference to the following examples which are illustrative only and non-limiting.

DESCRIPTION OF THE FIGURES

FIG. **1** is a graph showing overrun as a function of protein concentration of hydrophobin, sodium caseinate and skimmed milk powder in water

FIG. **2** is a graph showing the foam stability of 0.1 wt % Hydrophobin expressed as overrun. Foam stability is shown for hydrophobin in (1) water (2) a 20 wt % sucrose solution and (3) a solution of 20 wt % sucrose and 1 wt % guar gum.

FIG. **3***a* is a graph comparing the foam stability of 0.1 wt % Hydrophobin in water with aqueous solutions of 2 wt % sodium caseinate, 2.86 wt % skimmed milk powder (equivalent to about 1 wt % protein) and 6.67 wt % whey protein (equivalent to about 2 wt % protein). The foams produced using hydrophobin are considerably more stable than those from conventional proteins.

FIG. **3***b* is a graph comparing the foam stability of 0.1 wt % Hydrophobin and 2 wt % sodium caseinate in 20 wt % sucrose solution. The foam produced using hydrophobin is considerably more stable than that from 2% sodium caseinate.

FIG. **3***c* is a graph comparing the foam stability of 0.1 wt % Hydrophobin and 2 wt % sodium caseinate in a solution of 20 wt % sucrose and 1 wt % guar gum. The foam produced using hydrophobin is considerably more stable than that from 2% sodium caseinate.

FIG. **4***a* is a scanning electron micrograph of an aerated food product of the invention after 1 day.

FIG. **4***b* is a scanning electron micrograph of an aerated food product of the invention after 2 weeks at chill temperature.

FIG. **5** is a graph showing the interfacial rheological properies (G' and G") of the air/water interface in the presence of hydrophobin. It should be noted that the values increase to such an extent that they go beyond the capability of the instrument.

FIG. **6** is a graph showing the interfacial elasticity (G') at the air/water interface of 0.00035 wt % hydrophobin in comparison with 0.0007 wt % sodium caseinate and whey protein. Although the hydrophobin reading goes off scale, the result show that the interfacial elasticity of hydrophobin is significantly higher than those formed by convention proteins.

FIG. **7** is a diagram showing shear regimes for the aerated frozen products.

FIG. **8** is a scanning electron micrograph of product microstructures—fresh and after abuse (Magnification ×100)

FIG. **9** is a scanning electron micrograph of product microstructures—fresh and after abuse (Magnification ×300)

EXAMPLE 1

Foamability

(a) Sodium Caseinate, Skimmed Milk Protein or Hydrophobin in Water

The foamability of *Trichoderma reesei* hydrophobin II (HFB II) was compared to that of the widely used, foamable, dairy protein sodium caseinate (DMV International, the Netherlands. 88-90% protein, 1.5% fat and 6% moisture) and skimmed milk (United Milk, UK. 33-36% protein, 0.8% fat, 3.7% moisture). HFBII was obtained from VTT Biotechnology, Finland (purified from *Trichoderma reesei* essentially as described in WO00/58342 and Linder et al., 2001, Biomacromolecules 2: 511-517).

The table below shows the concentrations of the protein solutions that were prepared.

TABLE 1

Solutions prepared

Protein source	Concentration wt %	Shear time (seconds)
HFB II ex *T. Reesei*	0.05	600
HFB II ex *T. Reesei*	0.08	600
HFB II ex *T. Reesei*	0.1	600
Sodium caseinate	0.1	600
Sodium caseinate	0.5	300
Sodium caseinate	1	120
Sodium caseinate	2	60
SMP	0.29	600
SMP	1.43	345
SMP	2.86	165
SMP	5.71	60

The dairy protein solutions were prepared using a magnetic stirrer and the protein was sprinkled into the water at room temperature. The solution was then heated to 60° C., held for 5 minutes and then cooled to 5° C. The HFB II solutions were prepared by using a Sonicor ultrasonic bath model SC-42 (Sonicor Instrument Corp). The HFB II was added either as an aliquot or dry powder which was sonicated for between 30 seconds to 1 minute at room temperature until all of the HFB was dispersed and a clear liquid obtained. This solution was also cooled to 5° C. before aeration.

Foams were produced by shearing each solution for up to a maximum of 10 minutes in a cooled (2° C.) cylindrical, vertically mounted, jacketed stainless steel vessel with internal proportions of 105 mm height and diameter 72 mm. The lid of the vessel fills 54% of the internal volume leaving 46% (180 ml) for the sample. The rotor used to shear the sample consists of a rectangular impeller of the correct proportions to scrape the surface edge of the container as it rotates (dimensions 72 mm×41.5 mm). Also attached to the rotor are two semi-circular (60 mm diameter) high-shear blades positioned at a 45° angle to the rectangular attachment.

80 ml of solution was poured into the vessel, enough to cover half the rotor, and the lid secured. The solution was then sheared at 1250 rpm for the aforementioned period (table 1). The aerated solution was then immediately poured into a measuring cylinder, thus giving a measure of overrun by volume. Foamability refers to the volume of foam is stated in terms of percentage "overrun", and based on the definition by Arbuckle (ibid).

$$\text{Overrun \%} = 100 \times (\text{volume of foam} - \text{volume of unaerated solution}) / (\text{volume unaerated solution})$$

FIG. **1** shows the overruns obtained for the sodium caseinate, SMP and HFB II.

These results show that hydrophobin is at least as foamable as sodium caseinate and SMP, with a lower concentration needed to generate a similar overrun.

(b) Sodium Caseinate and HFB in the Presence of Other Ingredients

Sodium caseinate and HFB II were also aerated in the presence of 20% sucrose (Tate and Lyle) and 20% sucrose+0.5% guar gum (Willy Benecke, Germany. 78% gum, 14% moisture, 7% protein, 4% acid insoluble residue, 1% fat and 1% ash). In the case of sodium caseinate with sucrose the dry powders were combined and then slowly added to the water at room temperature that was being mixed on a magnetic stirrer. The solution was then heated to 60° C., held for 5 minutes and then cooled to 5° C. When guar gum was present the guar was added to the solution first with half of the sucrose at room temperature. This solution was then heated to 80° C. and held for 5 minutes before being cooled to 60° C. At this point the sodium caseinate was added with the rest of the sucrose. Stirring was continued at the temperature for 30 minutes before cooling to 5° C. In the case of HFB II, it was added separately to a cooled sucrose or sucrose guar solution either as an aliquot or a dry powder. Initial mixing was carried out on a magnetic stirrer followed by 30 seconds in the ultrasonic bath. Table 2 shows the solutions prepared.

These solutions were aerated for 10 minutes as described in section (a) and the overrun obtained by volume in a measuring cylinder. Table 2 shows the overrun obtained for each sample.

TABLE 2

Sample	Protein concentration (% w/w)	Average overrun %
0.1% NA Cas + sucrose	0.1	78.75
0.1% NA Cas + sucrose + 0.5% guar gum	0.1	70
0.1% NA Cas + sucrose + 1% guar gum	0.1	55
0.1% HFB + sucrose	0.1	75
0.1% HFB + sucrose + 0.5% guar gum	0.1	83
0.1% HFB + sucrose + 1% guar gum	0.1	96

These results show that hydrophobin has similar foamability to sodium caseinate in a more complex system including sugar, and optionally guar.

EXAMPLE 2

Foam Stability

The stability of an HFB II foam was compared to some commonly used dairy proteins: whey, skimmed milk powder and sodium caseinate. After production, foams were poured into a measuring cylinder to assess their stability in terms of foam volume as a function of time. The volume of foam is stated in terms of percentage "overrun", and based on the definition by Arbuckle (ibid).

$$\text{Overrun \%} = 100 \times (\text{volume of foam-volume of unaerated solution}) / (\text{volume unaerated solution})$$

The stability of these foams was measured by monitoring samples contained in 250 ml measuring cylinders and recording serum level and foam height over time at room temperature. The liquid in the foams drain over time, leading to two separate and distinct layers: a foam on top, and aqueous solution below. This is because the aqueous phase does not contain a significant amount of, or any, viscosifiers. However, it is the stability of the foam phase that is the point of interest

here. For the calculation of overrun, the volume of foam is taken as the entire volume of the system, i.e. both air (foam) phase and liquid phase irrespective of whether they have separated into two distinct layers. The value of overrun therefore gives a quantitative indication of the stability of the foam to typical break down mechanisms such as coalescence (with themselves and the atmosphere) and disproportionation.

Proteins were dispersed in water alone and in the presence of both 20% sucrose and 20% sucrose+1% guar gum. Table 3 shows the samples that were prepared. Whey powder (Avonol 600—30 wt % protein, 3.5 wt % moisture, 2.5 wt % fat, 7 wt % ash and 53 wt % lactose) was obtained from Glanvia, Ireland.

TABLE 3

Protein source	Protein concentration	Shear time (seconds)
HFB II	0.1	600
HFB II + 20% sucrose	0.1	600
HFB II + 20% sucrose and 1% guar gum	0.1	600
Sodium caseinate	2	60
Sodium caseinate + 20% sucrose	2	60
Sodium caseinate + 20% sucrose and 1% guar gum	2	60
Skimmed milk powder	2.86	165
Whey powder	6.67	45

The dairy protein solutions were prepared using a magnetic stirrer and the protein was sprinkled into the water at room temperature. The solution was then heated to 60° C., held for 5 minutes and then cooled to 5° C. The HFB II solutions were prepared by using a Sonicor ultrasonic bath model SC-42 (Sonicor Instrument Corp). The HFB II was added either as an aliquot or dry powder which was sonicated for between 30 seconds to 1 minute at room temperature until all of the HFB was dispersed and a clear liquid obtained. This solution was also cooled to 5° C. before aeration.

When 20% sucrose and 20% sucrose+0.5% guar were present the preparation was slightly different. In the case of sodium caseinate with sucrose the dry powders were combined and then sprinkled into the water at room temperature which was being mixed on a magnetic stirrer. The solution was then heated to 60° C., held for 5 minutes and then cooled to 5° C. When guar gum was present the guar was added to the solution first with half of the sucrose at room temperature. This solution was then heated to 80° C. and held for 5 minutes before being cooled to 60° C. At this point the sodium caseinate was added with the rest of the sucrose, stirring was continued at the temperature for 30 minutes before cooling to 5° C. In the case of HFB II, it was added separately to a cooled sucrose or sucrose guar solution either as an aliquot or a dry powder. Initial mixing was carried out on a magnetic stirrer followed by 30 seconds in the ultrasonic bath. Foams were produced as described in Example 1, except that different shear terms were used so as to generate in each case about 100% overrun.

The microstructure of the hydrophobin foam was visualised by Low Temperature Scanning Electron Microscopy (LTSEM). The foam sample was first cut at +5° C. and plunged into liquid nitrogen. The sample was left at −80° C. on dry ice prior SEM sample preparation. A sample section was cut carefully because of its very fragile structure. This section, approximately 6 mm×6 mm×10 mm in size, was mounted on a sample holder using a compound: OCT™ on the point of freezing (supplied by Agar Scientific). The sample including the holder is plunged into liquid nitrogen slush and transferred to a low temperature preparation chamber: Oxford Inst. CT1500HF. The chamber is under vacuum, approximately 10^{-4}-10^{-5} mbar. The sample is kept at a temperature below −110° C. on a cold stage. The sample is fractured inside the chamber using a scalpel blade and coated with gold using argon plasma This process also takes place under vacuum with an applied pressure of 10^{-1} millibars and current of 5 milliamps for 30 seconds. The sample is then transferred to a conventional Scanning Electron Microscope (JSM 5600), fitted with an Oxford Instruments cold stage at a temperature of −150° C. The sample is examined and areas of interest captured via digital image acquisition software.

Results—Foam Stability of Foam Created Using Hydrophobin

Foam produced using hydrophobin remained stable over a long time period in all three systems tested (water, +sucrose, +sucrose and guar)—see FIG. **2**.

Results—Comparison of Foam Stability of Proteins in Water

Foams produced from sodium caseinate, skimmed milk powder, and whey protein are all very unstable compared to foam produced using hydrophobin (see FIG. **3**A). Further, higher concentrations of skimmed milk powder and whey protein solutions are required to attain an initial overrun of 100% than the concentration needed for hydrophobin.

Results—Comparison of Foam Stability of Hydrophobin and Sodium Caseinate in the Presence of Sucrose/Guar Gum

Foams produced using hydrophobin remaining very stable for a considerable period of time (2 weeks) whereas foams produced using sodium caseinate were stable for under 20 mins in the presence of sucrose (FIG. **3***b*) and under about 2 hours in the presence of the sucrose and guar gum (FIG. **3***c*).

Therefore, hydrophobin can be used at a low concentration to create significant amounts of foam which remain very stable relative to other commonly used proteins.

In summary, the data show that the foam that is created with 0.1% HFB II is more stable that those produced by the other proteins tested. All the foams drain over time (which can be reduced by the addition of thickeners), but the bubbles for the hydrophobin foams still remain stable, i.e. the foam system still retains the air (overrun). In addition, we have found that the bubbles present in foams made with hydrophobin remain stable to bubble coarsening at chill temperatures for at least 2 weeks (see FIG. **4** which shows SEM micrographs demonstrating that bubble size is substantially unchanged after 2 weeks). Hence, hydrophobin improves the stability of foams in terms of both foam volume and bubble size. It should be noted that the fractures observed on the surface of the bubbles are believed to be artefacts of the SEM preparation procedure.

EXAMPLE 3

Measurement of Surface Viscosity and Elasticity Using Surface Rheometry

A Camtel CIR-100 interfacial rheometer (Camtel Instruments Limited, Royston, Herts, UK), was used to measure the surface viscosity and elasticity. Such data give an indication of how well an adsorbed molecule will stabilise a foam.

The instrument was used in the normalised resonance mode, using a 13 mm diameter du Nouy ring at the surface of the liquid in a 46 mm diameter sample dish. The ring oscillates on the sample surface, and a high-resolution displacement sensor is used to monitor strain amplitude over the range +/−1°.

Each run was carried out using the same experimental conditions. The runs were time sweeps, with the starting frequency at 3 Hz, and starting amplitude at 10,000 μRadians, and measurements taken at room temperature. The test dura-

tion was set at 36,000 seconds, with 240 data points gathered during that time. The physical parameters of interest are G' (storage modulus) and G" (loss modulus) as a function of time, which give an indication of the viscoelasticity of the adsorbed surface layer.

Protein samples were diluted with water to the required concentration. The surface rheology measurements are made relative to pure water, which was measured prior to measurement of the protein solutions.

The surface rheology data is shown in FIGS. **5** and **6**. For the hydrophobin protein, G' and G" increase gradually over time, before a rapid increase in both is observed. In the examples shown, the values increase to such an extent that they go beyond the measuring capabilities of the experimental set up. Even at very low concentrations (less than 0.001 wt %), the values for G' and G" reach values far in excess of the proteins used as comparisons: whey protein and sodium caseinate.

It can be concluded from these data that hydrophobin stabilises foams effectively by forming very strong viscoelastic surface layers around the bubbles. These lead to good stability against typical foam destabilising mechanisms such as coalescence and disproportionation. We believe that whey protein and sodium caseinate foams are both less stable that hydrophobin foams, since the surface layers do not exhibit G' and G" values as high as hydrophobin at comparable solution concentrations.

Accordingly, hydrophobins can be used to inhibit bubble coarsening in an aerated food product, for example by inhibiting or reducing disproportionation and/or coalescence. Similarly, hydrophobins can be used to stabilise foams in an aerated food product. Further, given that hydrophobins inhibit bubble coarsening, it will be possible to improve shape retention and rigidity of aerated products.

EXAMPLE 4

Aerated Frozen Products

Aerated frozen products were prepared using 3 types of protein:

A: Sodium Caseinate (Na Cas)

B: Skimmed Milk Powder (SMP)

C: Hydrophobin (HFBII) from *Trichoderma Reesei*

Microstructural and physical properties of the products were compared, both before and after temperature abuse regimes.

Materials

Details of the materials used are summarised in Table 4 and the formulations from which each of the aerated frozen products was prepared are shown in Table 5.

TABLE 4

Materials used

Ingredient	Composition	Supplier
Sodium caseinate	88-90% protein, 1.5% fat, 6% moisture	DMV International, The Netherlands.
Skimmed milk powder	33-36% protein, 0.8% fat, 3.7% moisture	United Milk, UK.
Hydrophobin type II (HFB II)	Purified from *Trichoderma reesei* essentially as described in WO00/58342 and Linder et al, 2001, Biomacromolecules 2: 511-517).	VTT Biotechnology, Finland.
Refined Coconut Oil		Van den Bergh Foods, Limited
Sucrose		Tate and Lyle, UK.

TABLE 5

Formulations used

Ingredient	Mix A	Mix B	Mix C
	Concentration/wt %		
Sodium caseinate	2.0	—	—
Skimmed milk powder	—	11.42	—
HFB II	—	—	0.2
Coconut Oil	5.0	5.0	5.0
Sucrose	25.0	20.0	25.0
Water	68.0	63.58	69.8

Preparation of the Aerated Frozen Products

Mix (Emulsion) Preparation

All mixes were made in 100 g batches. For Mixes A and B (containing sodium caseinate and skimmed milk powder, respectively), the protein was combined with the sucrose and dispersed into cold water using a magnetic stirrer. The solution was then heat to 60° C. with stirring and held for 5 minutes before being cooled to 40° C. Molten coconut fat was then added and the aqueous mix immediately sonicated (Branson Sonifer with 6.4 mm tapered tip) for 3 minutes at 70% amplitude with the tip well immersed in the solution. The emulsion was then cooled rapidly in a −10° C. water bath until the solution temperature was 5° C., to crystallise the fat droplets. The mixes were stored at 5° C. until further use.

For Mix C (containing HFB II), the sucrose was first dispersed into cold water with stirring. Then, half of the required concentration of HFB II was added to this as an aliquot. The solution was then gently sonicated in a sonic bath for 30 seconds to fully disperse the HFB II. This solution was then stirred on a magnetic stirrer and heated to 40° C. Before the molten fat was added the solution was again sonicated in a sonic bath for 30 seconds. The molten fat was then added and the mix was emulsified and cooled as described for Mixes A and B. A further aliquot of HFB II was then added to this cold solution to bring the HFB II concentration up to 0.2%. The first 0.1% of HFB II was for emulsifying and stabilising the fat. The second addition of HFB II would provide adequate excess HFBII to provide good aeration and foam stability.

Particle size analysis on the chill emulsions was performed using a Malvern Mastersizer 2000.

Analysis of Emulsions

Following this methodology, we were able to make emulsions with small fat droplets. A summary of oil droplet sizes measured are shown in Table 6.

TABLE 6

Emulsion particle size as measured using the Malvern Mastersizer 2000

Mix	Fat droplet diameter D(3,2)/μm
A (Na Cas)	0.4
B (SMP)	0.25
C (HFB II)	1.88

Shear Freezing Process

80 ml of mix was sheared and frozen simultaneously in the vessel described in Example 1. In essence an aerated and frozen prototype is produced as follows: The mix inside the enclosed container is mixed with an impeller at a high shear rate in order to incorporate air. Simultaneously, the coolant flows around the container jacket to cool and freeze the mix. The impeller also scrapes the inside wall, removing the ice that forms there and incorporating this into the rest of the mix. High shear is used to initially aerated the mix, and then the shear rate is slowed in order to allow better cooling and freezing. The shear regimes used for each mix are graphically presented in FIG. **7**.

For the freezing and aeration step with Mixes A and B (containing sodium caseinate and skimmed milk powder, respectively) the coolant (set at −18° C.) was set to circulate from Time=0 minutes. The relatively slow stirring at the start for Mixes A and B allowed for cooling of the mix and generation of some viscosity (via ice formation and incorporation) prior to aeration using higher shear. A short time at high speed incorporated the air and then the speed was stepped down to allow the samples to reach at least −5° C.

For Mix C (containing HFB II) the pot was chilled to about 5° C. and the sample added and the high shear for aerated started. The coolant (set at −18° C.) was not switched to circulate on until 9 minutes due to the increased time required to generate 100% overrun. Once the coolant was switched on to circulate (at 9 minutes), the same shear-cooling pattern as previous (for A and B) was adopted.

At the end of the process, overrun was measured and samples (approximately 15 g) were placed into small pots. Each product was cooled further for 10 minutes in a freezer set at −80° C. before being stored at −20° C.

Analysis of Aerated Frozen Products

All aerated frozen products were stored under two temperature regimes:

(a) −20° C. Subsequent analysis was made within one week of production and we deem this as "fresh" product.

(b) Temperature abused samples were subject to storage at −10° C. for 1 or 2 weeks, and then subsequently stored at −20° C. before analysis.

TABLE 8

Process details and product overrun for products prepared from Mixes A, B, and C.

Sample	Shear time at 1200 rpm min	Overrun %	End product temperature ° C.
A (Na Cas)	1	103	−5.3
B (SMP)	1	98	−8
B (SMP)	1	94	−5.6
C (HFB II)	10	75	−5

Final products were analysed as follows:

Overrun of freshly made product

SEM analysis on fresh and temperature abused product

Melting behaviour on fresh and temperature abused product

Overrun

The overrun for each of the products is summarised in Table 8. All of the mixes were aeratable and incorporated significant amounts of air.

Microstructural Stability: Methodology

Scanning Electron Microscopy (SEM)

The microstructure of each products was visualised using Low Temperature Scanning Electron Microscopy (LTSEM). The sample was cooled to −80 ° C. on dry ice and a sample section cut. This section, approximately 5 mm×5 mm×10 mm in size, was mounted on a sample holder using a Tissue Tek: OCT™ compound (PVA 11%, Carbowax 5% and 85% non-reactive components). The sample including the holder was plunged into liquid nitrogen slush and transferred to a low temperature preparation chamber: Oxford Instrument CT1500HF. The chamber is under vacuum, approximately 10^{-4} bar, and the sample is warmed up to −90° C. Ice is slowly etched to reveal surface details not caused by the ice itself, so water is removed at this temperature under constant vacuum for 60 to 90 seconds. Once etched, the sample is cooled to −110° C. ending up the sublimation, and coated with gold using argon plasma. This process also takes place under vacuum with an applied pressure of 10^{-1} millibars and current of 6 milliamps for 45 seconds. The sample is then transferred to a conventional Scanning Electron Microscope (JSM 5600), fitted with an Oxford Instruments cold stage at a temperature of −160° C. The sample is examined and areas of interest captured via digital image acquisition software.

Microstructural Analysis: Results

Scanning Electron Microscopy (SEM) was used to examine the microstructure of the fresh and temperature abused frozen products. Representative images can be seen in FIGS. **8** and **9** at different magnifications.

After temperature abuse the SEM images clearly show that the HFB II containing product (from Mix C) has retained its original microstructure, i.e. there is little apparent air bubble coarsening. This is the case after 1 and 2 weeks storage at −10° C. However, the prototypes containing Na Cas and SMP (from Mix A and B, respectively) show very severe coarsening of the gas structure under temperature abused at −10° C. after just one week.

Overall, it is clear that the frozen product made containing HFBII shows much greater stability to temperature abuse than the frozen product made using sodium caseinate or skim milk powder. HFBII has an influence on air bubble stability.

Melting Behaviour: Methodology

Samples of frozen product were placed on a metal grid at room temperature (20° C.). Differences in the way the products melted, notably shape retention and foam stability, were observed as a function of time.

Melting Behaviour: Results

These microstructural differences (stable foam and stable ice) had some impact on the melting behavior of the frozen product. The aerated frozen sample made from Mix C (containing HFBII) retained its shape better on melting, compared to the product made with sodium caseinate or skimmed milk powder (i.e. Mixes A and B, respectively).

As the ice melted and formed water, it flowed through the melting grid. However, for the product with HFBII, much of the foam also remained on the grid with some stable drops of foam observed beneath—neither of these characteristics was observed with the conventional proteins (sodium caseinate and skimmed milk powder). This illustrates the differences in the foam stability between each of the proteins used.

Textural Differences between Products A, B, and C

Clear differences in texture between the three samples could also be observed after one week storage at −10° C. (i.e. temperature abused samples). On handling the product made using sodium caseinate (A) and skimmed milk powder (B), these were noticed to have a very soft and very flaky texture, which was difficult to cleanly remove from the silicon paper used to line the sample pot. The product made using HFBII (C), on the other hand, was very firm and released from the silicon paper lining the sample pot very cleanly. In other words, the product prepared using HFBII shows much greater stability to temperature abuse on both a microscopic and macroscopic scale than product prepared using sodium caseinate or skim milk powder.

The various features and embodiments of the present invention, referred to in individual sections above apply, as appropriate, to other sections, *mutatis mutandis*. Consequently features specified in one section may be combined with features specified in other sections, as appropriate.

All publications mentioned in the above specification are herein incorporated by reference. Various modifications and variations of the described methods and products of the invention will be apparent to those skilled in the art without departing from the scope of the invention. Although the invention has been described in connection with specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are apparent to those skilled in the relevant fields are intended to be within the scope of the following claims.

SEQUENCE LISTING

<160> NUMBER OF SEQ ID NOS: 2

<210> SEQ ID NO 1
<211> LENGTH: 4106
<212> TYPE: PRT
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Hydrophobin
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (1)..(2000)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2002)..(2006)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2007)..(2010)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2013)..(2023)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2024)..(2051)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2053)..(2060)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2061)..(2075)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2077)..(2081)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2082)..(2085)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2088)..(2093)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2094)..(2105)

-continued

<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2107)..(4106)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing

<400> SEQUENCE: 1

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
85 90 95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
100 105 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
115 120 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
145 150 155 160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
165 170 175

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
180 185 190

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
195 200 205

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
210 215 220

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
225 230 235 240

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
245 250 255

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
260 265 270

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
275 280 285

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
290 295 300

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
305 310 315 320

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
325 330 335

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
340 345 350

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
355 360 365

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

-continued

370 375 380

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
385 390 395 400

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
405 410 415

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
420 425 430

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
435 440 445

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
450 455 460

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
465 470 475 480

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
485 490 495

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
500 505 510

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
515 520 525

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
530 535 540

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
545 550 555 560

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
565 570 575

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
580 585 590

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
595 600 605

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
610 615 620

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
625 630 635 640

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
645 650 655

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
660 665 670

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
675 680 685

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
690 695 700

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
705 710 715 720

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
725 730 735

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
740 745 750

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
755 760 765

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
770 775 780

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
785 790 795 800

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
805 810 815

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
820 825 830

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
835 840 845

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
850 855 860

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
865 870 875 880

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
885 890 895

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
900 905 910

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
915 920 925

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
930 935 940

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
945 950 955 960

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
965 970 975

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
980 985 990

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
995 1000 1005

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1010 1015 1020

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1025 1030 1035

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1040 1045 1050

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1055 1060 1065

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1070 1075 1080

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1085 1090 1095

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1100 1105 1110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1115 1120 1125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1130 1135 1140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1145 1150 1155

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1160 1165 1170

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1175 1180 1185

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1190 1195 1200

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1205 1210 1215

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1220 1225 1230

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1235 1240 1245

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1250 1255 1260

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1265 1270 1275

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1280 1285 1290

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1295 1300 1305

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1310 1315 1320

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1325 1330 1335

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1340 1345 1350

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1355 1360 1365

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1370 1375 1380

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1385 1390 1395

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1400 1405 1410

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1415 1420 1425

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1430 1435 1440

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1445 1450 1455

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1460 1465 1470

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1475 1480 1485

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1490 1495 1500

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1505 1510 1515

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1520 1525 1530

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1535 1540 1545

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1550 1555 1560

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1565 1570 1575

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1580 1585 1590

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1595 1600 1605

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

-continued

1610 1615 1620

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1625 1630 1635

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1640 1645 1650

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1655 1660 1665

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1670 1675 1680

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1685 1690 1695

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1700 1705 1710

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1715 1720 1725

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1730 1735 1740

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1745 1750 1755

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1760 1765 1770

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1775 1780 1785

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1790 1795 1800

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1805 1810 1815

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1820 1825 1830

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1835 1840 1845

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1850 1855 1860

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1865 1870 1875

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1880 1885 1890

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1895 1900 1905

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1910 1915 1920

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1925 1930 1935

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1940 1945 1950

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1955 1960 1965

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1970 1975 1980

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1985 1990 1995

Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Cys Xaa
2000 2005 2010

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2015 2020 2025

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2030 2035 2040

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa
2045 2050 2055

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2060 2065 2070

Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Cys Xaa
2075 2080 2085

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2090 2095 2100

Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2105 2110 2115

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2120 2125 2130

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2135 2140 2145

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2150 2155 2160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2165 2170 2175

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2180 2185 2190

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2195 2200 2205

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2210 2215 2220

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2225 2230 2235

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2240 2245 2250

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2255 2260 2265

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2270 2275 2280

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2285 2290 2295

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2300 2305 2310

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2315 2320 2325

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2330 2335 2340

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2345 2350 2355

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2360 2365 2370

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2375 2380 2385

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2390 2395 2400

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2405 2410 2415

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2420 2425 2430

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2435 2440 2445

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2450 2455 2460

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2465 2470 2475

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2480 2485 2490

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2495 2500 2505

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2510 2515 2520

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2525 2530 2535

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2540 2545 2550

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2555 2560 2565

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2570 2575 2580

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2585 2590 2595

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2600 2605 2610

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2615 2620 2625

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2630 2635 2640

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2645 2650 2655

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2660 2665 2670

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2675 2680 2685

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2690 2695 2700

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2705 2710 2715

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2720 2725 2730

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2735 2740 2745

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2750 2755 2760

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2765 2770 2775

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2780 2785 2790

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2795 2800 2805

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

-continued

2810 2815 2820

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2825 2830 2835

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2840 2845 2850

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2855 2860 2865

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2870 2875 2880

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2885 2890 2895

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2900 2905 2910

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2915 2920 2925

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2930 2935 2940

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2945 2950 2955

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2960 2965 2970

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2975 2980 2985

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2990 2995 3000

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3005 3010 3015

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3020 3025 3030

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3035 3040 3045

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3050 3055 3060

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3065 3070 3075

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3080 3085 3090

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3095 3100 3105

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3110 3115 3120

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3125 3130 3135

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3140 3145 3150

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3155 3160 3165

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3170 3175 3180

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3185 3190 3195

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3200 3205 3210

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3215 3220 3225

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3230 3235 3240

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3245 3250 3255

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3260 3265 3270

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3275 3280 3285

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3290 3295 3300

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3305 3310 3315

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3320 3325 3330

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3335 3340 3345

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3350 3355 3360

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3365 3370 3375

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3380 3385 3390

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3395 3400 3405

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3410 3415 3420

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3425 3430 3435

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3440 3445 3450

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3455 3460 3465

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3470 3475 3480

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3485 3490 3495

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3500 3505 3510

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3515 3520 3525

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3530 3535 3540

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3545 3550 3555

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3560 3565 3570

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3575 3580 3585

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3590 3595 3600

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3605 3610 3615

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3620 3625 3630

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3635 3640 3645

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3650 3655 3660

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3665 3670 3675

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3680 3685 3690

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3695 3700 3705

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3710 3715 3720

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3725 3730 3735

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3740 3745 3750

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3755 3760 3765

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3770 3775 3780

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3785 3790 3795

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3800 3805 3810

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3815 3820 3825

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3830 3835 3840

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3845 3850 3855

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3860 3865 3870

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3875 3880 3885

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3890 3895 3900

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3905 3910 3915

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3920 3925 3930

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3935 3940 3945

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3950 3955 3960

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3965 3970 3975

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3980 3985 3990

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3995 4000 4005

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

-continued

```
    4010                4015                4020

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    4025                4030                4035

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    4040                4045                4050

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    4055                4060                4065

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    4070                4075                4080

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    4085                4090                4095

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa
    4100                4105
```

<210> SEQ ID NO 2
<211> LENGTH: 4367
<212> TYPE: PRT
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Hydrophobin
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (1)..(2000)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2002)..(2002)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2003)..(2051)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2053)..(2057)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2059)..(2059)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2060)..(2158)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2160)..(2160)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2161)..(2259)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2260)..(2260)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2261)..(2309)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing.
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2311)..(2315)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing.
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE

-continued

<222> LOCATION: (2317)..(2317)
<223> OTHER INFORMATION: Xaa may be any amino acid;
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2318)..(2366)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing.
<220> FEATURE:
<221> NAME/KEY: MISC_FEATURE
<222> LOCATION: (2368)..(4367)
<223> OTHER INFORMATION: Xaa may be any amino acid; One or more Xaa may be missing.

<400> SEQUENCE: 2

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
85 90 95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
100 105 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
115 120 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
145 150 155 160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
165 170 175

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
180 185 190

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
195 200 205

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
210 215 220

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
225 230 235 240

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
245 250 255

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
260 265 270

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
275 280 285

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
290 295 300

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
305 310 315 320

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
325 330 335

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
340 345 350

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
355 360 365

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
370 375 380

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
385 390 395 400

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
405 410 415

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
420 425 430

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
435 440 445

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
450 455 460

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
465 470 475 480

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
485 490 495

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
500 505 510

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
515 520 525

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
530 535 540

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
545 550 555 560

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
565 570 575

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
580 585 590

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
595 600 605

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
610 615 620

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
625 630 635 640

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
645 650 655

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
660 665 670

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
675 680 685

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
690 695 700

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
705 710 715 720

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
725 730 735

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
740 745 750

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
755 760 765

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

-continued

```
    770                 775                 780

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
785                 790                 795                 800

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                805                 810                 815

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            820                 825                 830

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        835                 840                 845

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    850                 855                 860

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
865                 870                 875                 880

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                885                 890                 895

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            900                 905                 910

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        915                 920                 925

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    930                 935                 940

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
945                 950                 955                 960

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                965                 970                 975

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            980                 985                 990

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
        995                 1000                1005

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1010                1015                1020

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1025                1030                1035

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1040                1045                1050

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1055                1060                1065

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1070                1075                1080

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1085                1090                1095

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1100                1105                1110

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1115                1120                1125

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1130                1135                1140

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1145                1150                1155

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1160                1165                1170

Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa Xaa Xaa  Xaa Xaa Xaa
    1175                1180                1185
```

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1190 1195 1200

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1205 1210 1215

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1220 1225 1230

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1235 1240 1245

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1250 1255 1260

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1265 1270 1275

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1280 1285 1290

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1295 1300 1305

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1310 1315 1320

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1325 1330 1335

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1340 1345 1350

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1355 1360 1365

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1370 1375 1380

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1385 1390 1395

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1400 1405 1410

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1415 1420 1425

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1430 1435 1440

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1445 1450 1455

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1460 1465 1470

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1475 1480 1485

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1490 1495 1500

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1505 1510 1515

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1520 1525 1530

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1535 1540 1545

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1550 1555 1560

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1565 1570 1575

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1580 1585 1590

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1595 1600 1605

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1610 1615 1620

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1625 1630 1635

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1640 1645 1650

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1655 1660 1665

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1670 1675 1680

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1685 1690 1695

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1700 1705 1710

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1715 1720 1725

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1730 1735 1740

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1745 1750 1755

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1760 1765 1770

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1775 1780 1785

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1790 1795 1800

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1805 1810 1815

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1820 1825 1830

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1835 1840 1845

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1850 1855 1860

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1865 1870 1875

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1880 1885 1890

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1895 1900 1905

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1910 1915 1920

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1925 1930 1935

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1940 1945 1950

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1955 1960 1965

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1970 1975 1980

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

-continued

1985 1990 1995

Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2000 2005 2010

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2015 2020 2025

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2030 2035 2040

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Cys
2045 2050 2055

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2060 2065 2070

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2075 2080 2085

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2090 2095 2100

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2105 2110 2115

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2120 2125 2130

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2135 2140 2145

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa
2150 2155 2160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2165 2170 2175

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2180 2185 2190

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2195 2200 2205

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2210 2215 2220

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2225 2230 2235

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2240 2245 2250

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2255 2260 2265

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2270 2275 2280

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2285 2290 2295

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Xaa
2300 2305 2310

Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2315 2320 2325

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2330 2335 2340

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2345 2350 2355

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2360 2365 2370

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2375 2380 2385

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2390 2395 2400

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2405 2410 2415

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2420 2425 2430

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2435 2440 2445

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2450 2455 2460

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2465 2470 2475

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2480 2485 2490

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2495 2500 2505

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2510 2515 2520

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2525 2530 2535

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2540 2545 2550

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2555 2560 2565

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2570 2575 2580

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2585 2590 2595

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2600 2605 2610

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2615 2620 2625

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2630 2635 2640

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2645 2650 2655

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2660 2665 2670

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2675 2680 2685

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2690 2695 2700

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2705 2710 2715

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2720 2725 2730

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2735 2740 2745

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2750 2755 2760

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2765 2770 2775

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2780 2785 2790

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2795 2800 2805

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2810 2815 2820

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2825 2830 2835

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2840 2845 2850

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2855 2860 2865

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2870 2875 2880

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2885 2890 2895

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2900 2905 2910

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2915 2920 2925

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2930 2935 2940

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2945 2950 2955

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2960 2965 2970

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2975 2980 2985

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
2990 2995 3000

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3005 3010 3015

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3020 3025 3030

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3035 3040 3045

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3050 3055 3060

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3065 3070 3075

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3080 3085 3090

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3095 3100 3105

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3110 3115 3120

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3125 3130 3135

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3140 3145 3150

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3155 3160 3165

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3170 3175 3180

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

-continued

3185 3190 3195

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3200 3205 3210

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3215 3220 3225

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3230 3235 3240

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3245 3250 3255

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3260 3265 3270

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3275 3280 3285

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3290 3295 3300

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3305 3310 3315

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3320 3325 3330

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3335 3340 3345

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3350 3355 3360

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3365 3370 3375

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3380 3385 3390

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3395 3400 3405

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3410 3415 3420

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3425 3430 3435

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3440 3445 3450

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3455 3460 3465

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3470 3475 3480

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3485 3490 3495

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3500 3505 3510

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3515 3520 3525

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3530 3535 3540

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3545 3550 3555

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3560 3565 3570

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3575 3580 3585

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3590 3595 3600

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3605 3610 3615

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3620 3625 3630

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3635 3640 3645

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3650 3655 3660

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3665 3670 3675

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3680 3685 3690

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3695 3700 3705

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3710 3715 3720

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3725 3730 3735

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3740 3745 3750

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3755 3760 3765

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3770 3775 3780

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3785 3790 3795

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3800 3805 3810

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3815 3820 3825

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3830 3835 3840

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3845 3850 3855

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3860 3865 3870

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3875 3880 3885

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3890 3895 3900

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3905 3910 3915

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3920 3925 3930

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3935 3940 3945

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3950 3955 3960

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3965 3970 3975

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3980 3985 3990

-continued

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
3995 4000 4005

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4010 4015 4020

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4025 4030 4035

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4040 4045 4050

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4055 4060 4065

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4070 4075 4080

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4085 4090 4095

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4100 4105 4110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4115 4120 4125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4130 4135 4140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4145 4150 4155

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4160 4165 4170

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4175 4180 4185

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4190 4195 4200

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4205 4210 4215

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4220 4225 4230

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4235 4240 4245

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4250 4255 4260

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4265 4270 4275

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4280 4285 4290

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4295 4300 4305

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4310 4315 4320

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4325 4330 4335

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4340 4345 4350

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
4355 4360 4365

The invention claimed is:

1. An aerated food product with foam comprising a biopolymer and at least about 0.01 weight % up to 0.2 weight % of an isolated Class II hydrophobin, wherein the amount of the isolated Class II hydrophobin within said range is effective to maintain aerated foam stability in terms of foam volume in the product for at least two weeks when the aerated food product with foam is maintained at 5° C.

2. The aerated food product of claim **1** which is an aerated frozen food product.

3. The aerated food product of claim **1** which is an aerated chilled food product.

4. The aerated food product of claim **1** which is an aerated confectionery product.

5. A food product which is later aerated to form a food product foam comprising a biopolymer and at least about 0.01 weight % up to 0.2 weight % of an isolated Class II hydrophobin, wherein amount of the upon aeration of the food product to form a food product foam, the amount of the isolated Class II hydrophobin within said range is effective to maintain foam stability in terms of foam volume in the aerated food product for at least two weeks when the food product foam is maintained at 5° C.

* * * * *